SEPTEMBER 15, 1947

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AUTOMOTIVE INDUSTRIES

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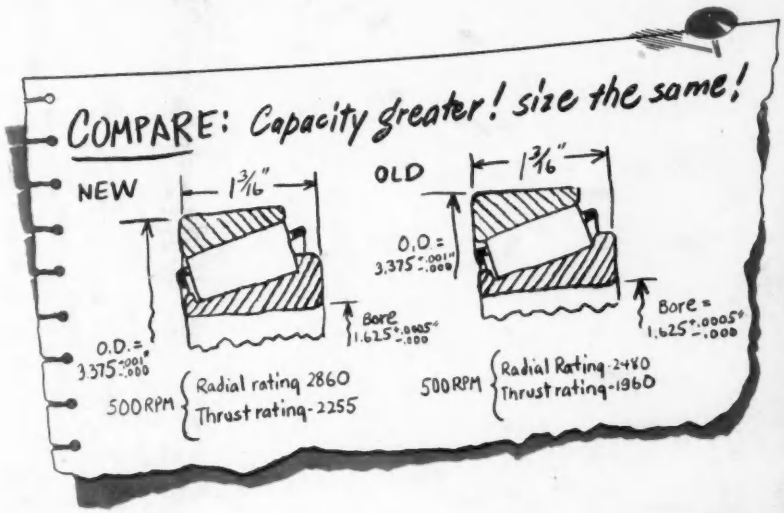
Space-saving idea for automatic transmissions



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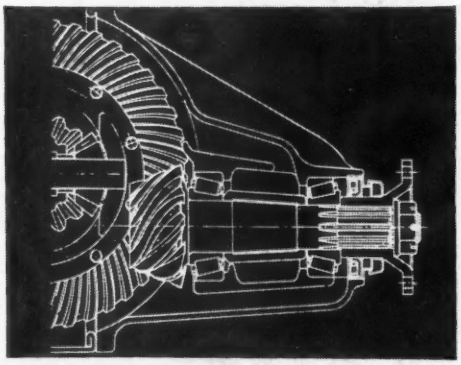

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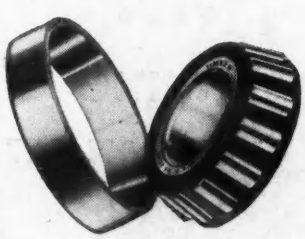

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AUTOMOTIVE INDUSTRIES

Published Semi-Monthly September 15, 1947 Vol. 97, No. 6

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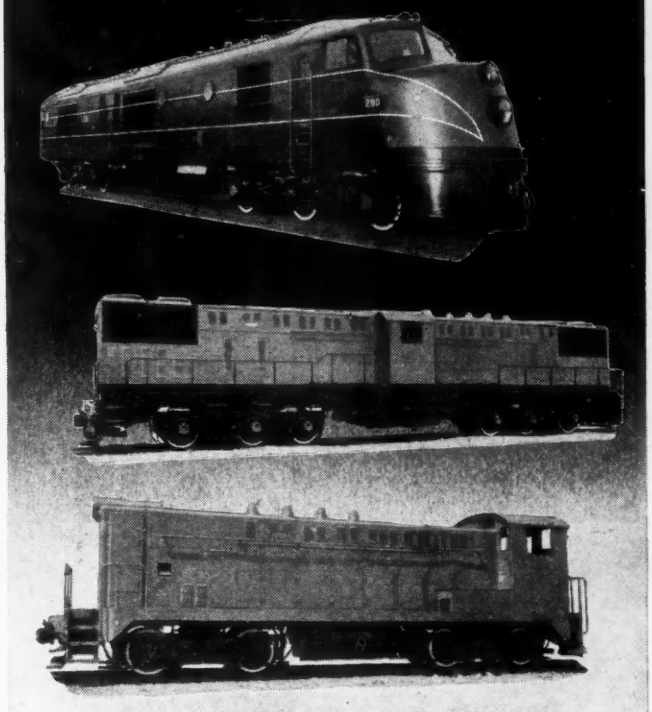

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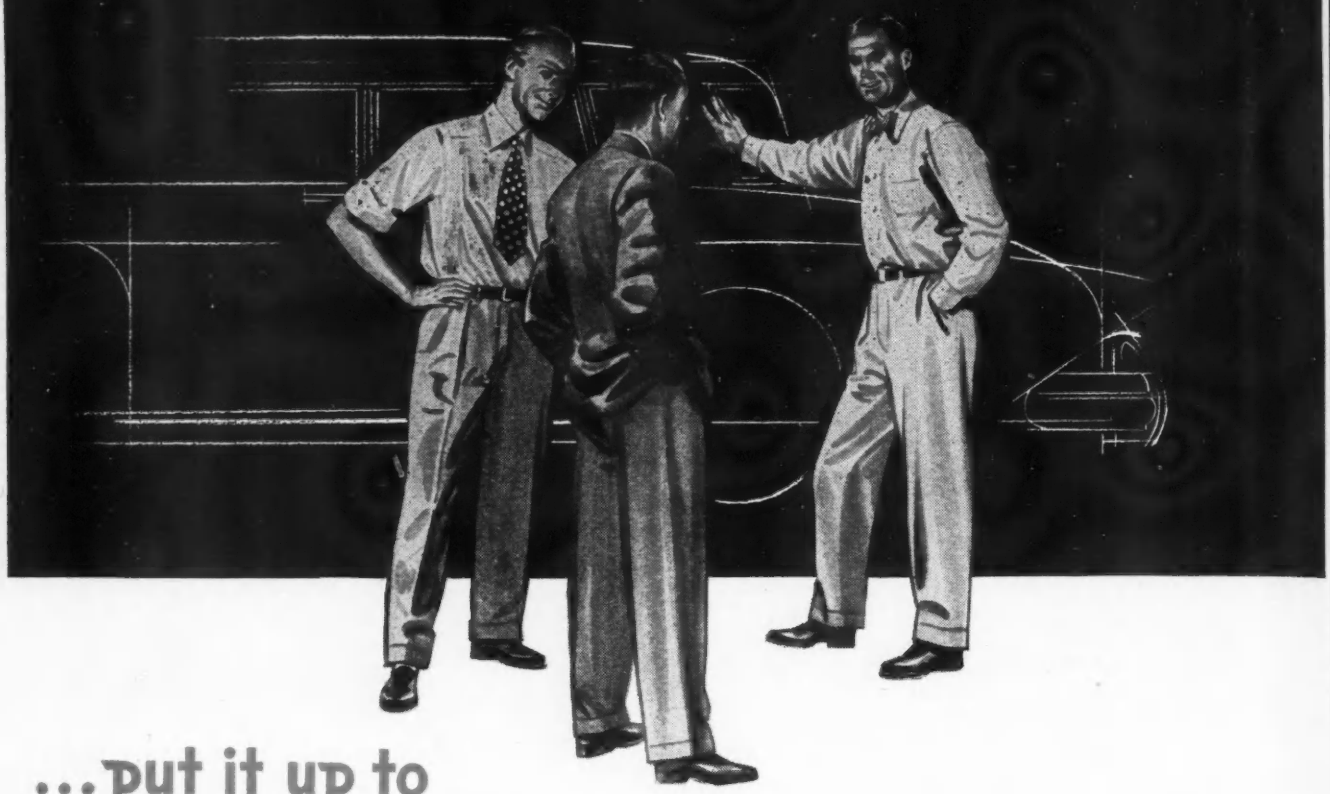

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AUTOMOTIVE INDUSTRIES

Published on the first and 15th of the month

September 15, 1947
Volume 97, No. 6

Some High Spots of this Issue

Drive System for Multiple-Wheel Drive Vehicles

Invented by Richard R. Ransom, consulting engineer, this new drive system for multiple-wheel drive vehicles has been thoroughly tested on a ¾-ton truck by the Army Ground Forces. A detailed analysis of the system begins on page 24.

New Fisher Body Plant in Flint

Fisher Body Division's spacious new building for assembling Chevrolet bodies is completely air conditioned, and provided with extensive fluorescent lighting. It adjoins the new Chevrolet assembly plant at Flint, contains two miles of conveyor lines, and has a complete paint department on the second floor. A description of this plant is presented on pages 28, 29 and 30.

Current Activities of Italian Automobile Firms

Italy produced 10,989 passenger cars and 17,994 industrial vehicles in 1946, as compared with 59,000 passenger cars and 11,777 industrial vehicles produced in 1938. However, their output is increasing with emphasis switched from trucks to passenger cars; but coal and steel shortages continue to hinder output. Complete details of Italian automobile production can be found on page 34.

Water-Injection Engines and New Lightplane Designs Highlight National Air Races

Tremendous power gains were obtained with water-injection equipment on racing planes in the 1947 National Air Races, but most impressive at this year's classic were the original lightplane designs introduced in the Goodyear Trophy contest. Design details of the new lightplane winners, along with other inside facts on lubricants and fuels used, are given in an unusually thorough article by Robert McLarren, beginning on page 42.

New Production Ceilings for Motor-Vehicle Production in Germany

According to new production ceilings, recently set by the United States and Great Britain for their zones in Western Germany, not more than 160,000 passenger cars and 63,500 commercial vehicles can be manufactured annually. However, it is extremely unlikely that this ceiling will even be reached this year, since there are only a few automobile plants now in operation, and shortages of coal and steel are still acute. This analysis of automobile production in Germany is presented on page 45.

21 New Production Equipment and New Product Items and Other High Spots Such As:

Flying-Wing performance as compared with conventional aircraft of equal size; tooling plans for production of the Davis D-2 car; structural details of a new Italian sports car, the Ferrari V-12; new features of the 1650 hp Twin Wasp; and Fairbanks modern new foundry at Freeport, Ill.

Comprehensive Interpretation of News of the Industries, Page 17
For Complete Table of Contents, See Page 3

AUTOMOTIVE INDUSTRIES
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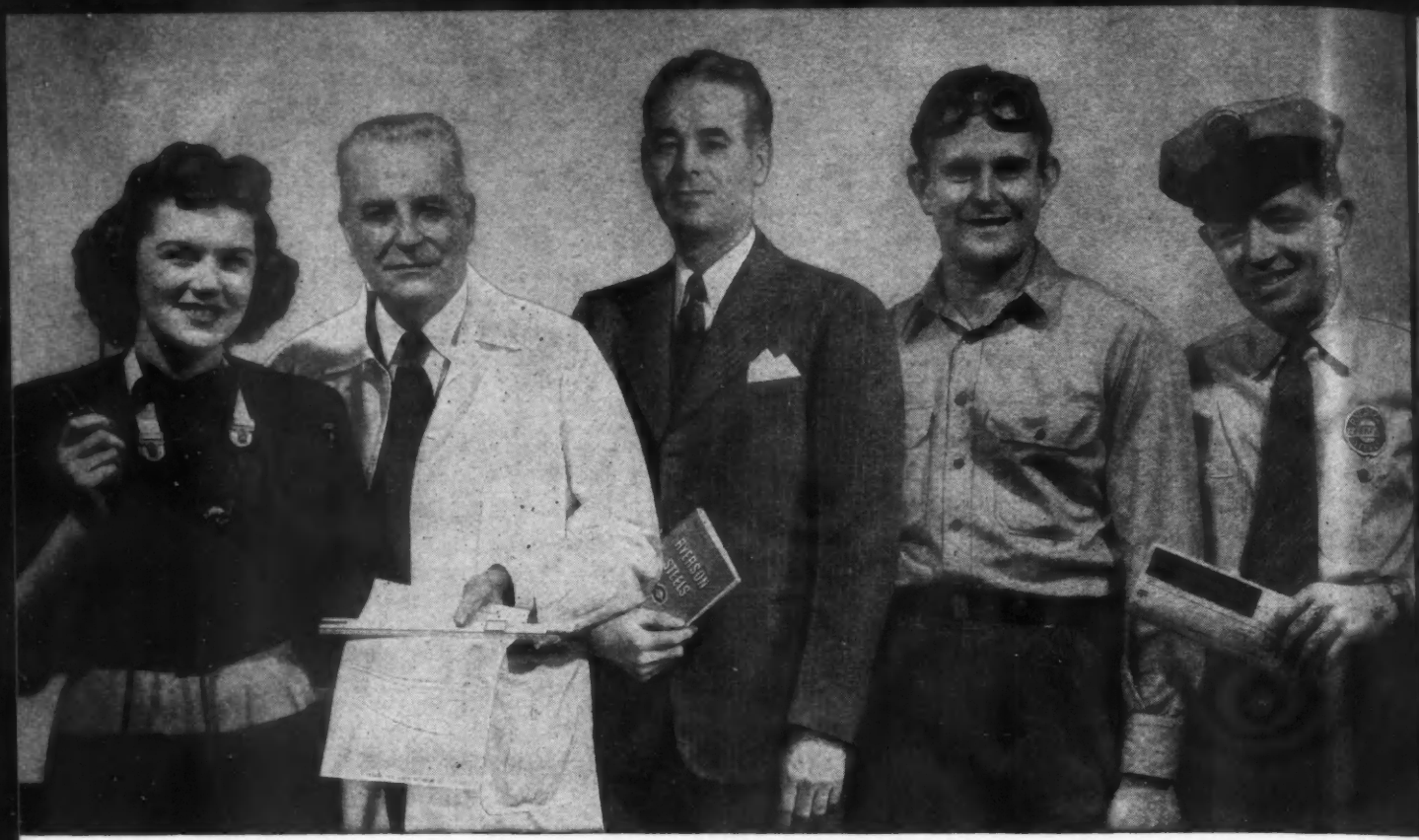

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Vol. 97, No. 6

NEWS of the AUTOMOTIVE INDUSTRIES

September 15, 1947

Price Boosts By Ford and Studebaker

The Ford Motor Co., the remaining member of the Big Three to raise prices, recently boosted the prices of regular Ford passenger cars $34 to $90, and prices of trucks $20 to $97, The Ford luxury line was raised from $199 to $229; Mercurys from $86 to $226, and Lincolns from $148 to $200. The new price increases were dictated by soaring operating costs. Strikes, steel and labor costs, and material shortages were listed among the abnormal economic situations which forced Ford to reverse its price reduction action, which last January saw automobile prices reduced from $15 to $50. The Studebaker Corp. raised prices from $50 to $115 on passenger cars; $50 on all heavy trucks; and $85 on all light trucks. Increased manufacturing costs were responsible for the increases, it was stated.

Tucker Meets WAA Provisions By Stock and Franchise Sale

Tucker Corp. has raised the required amount of capital to meet the qualifications laid down by WAA before it would lease the Dodge-Chicago plant to Tucker. The sale of stock has netted about $12.5 million, and Tucker has received about $6 million for the sale of dealer franchises. WAA has required that Tucker have $15 million in working capital as a condition of lease. Four million shares of Class A common stock were offered and 2.9 million, or less than 75 per cent were sold. Preston Tucker, president of the company, announced recently that contracts have not yet been signed for steel or other materials. He said also that mass production will be under way in January or February and that maximum output is expected to reach 1000 cars a day.

To Organize U.S. Outlets For British Austins

A national distributing organization will be set up in the U. S. by the Austin Motor Co., Ltd. Both the larger Austins, and the smaller size will be distributed, according to L. P. Lord, Austin's chairman, who brought four new "pre release" Austins with him to this country recently. About 1000 Austins have been sold in the U. S. since the end of the war.

Included among the four models Mr. Lord exhibited were the higher priced Sheerline and Princess four-door sedans, with 119-in. wheelbases, powered by six-cyl engines. The Dorset and the Devon, the two smaller cars shown, were four-door sedans with 102-in. wheelbases.

Graham-Paige Gets Rights To Make Swiss Tractor

Graham-Paige Motors Corp. has obtained the manufacturing rights for a new Swiss tractor of light weight, simple construction, especially designed for small scale farming operations. It has also acquired rights to manufacture several new farm implements designed in Europe for small acreage operations, according to J. W. Frazer, president. He revealed that plans are being made to manufacture the Rototiller in England, using magnesium and other lightweight metals. He said steel is very scarce in England, but that magnesium is available in abundant quantities.

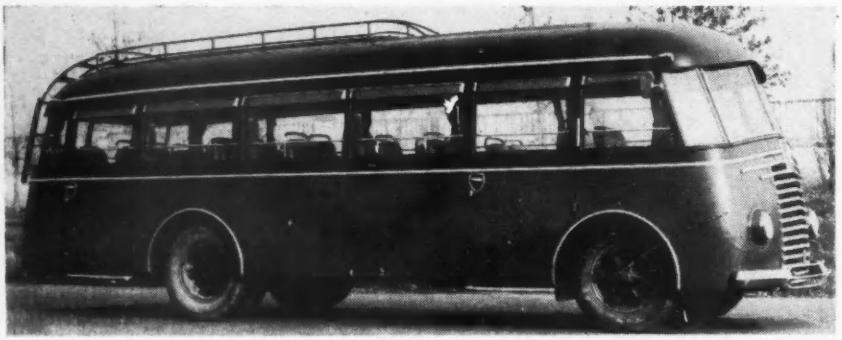
Widespread Effect of British Gasoline Ban

By eliminating the basic gasoline ration, which amounted to about 16 gal a month for the average car, the British Government has made the use of an automobile impossible for thousands of owners. From Oct. 1, only those whose business is considered essential to the country will be allowed to purchase gasoline. In the past, such persons have received a supplementary allowance, which generally was considerably in excess of the basic ration. The direct result is that cars will be taken off the road, and the government will lose income from gasoline taxes. It is safe to predict that the bottom will drop out of the used car market. Because of the inability to get possession of a new car, used vehicles had been bringing high prices; within 24 hours of the announcement of the decree, the drop in prices was as high as 40 per cent.

Repair shops, gasoline stations and service stations will suffer a severe loss. Probably many that had been opened since the end of the war

Moscow's Moskvich

Now being produced by the Low Power Motor Works in Moscow, this midget car, the Moskvich, is a four passenger sedan with an all-metal body. Designed for economical operation, it is said the car gives about 30 mpg. It reportedly has a top speed of about 55 mph, and weighs 1760 lb. Sovfoto.



Bound For Buenos Aires

Built by the Isotta Fraschini Co., Milan, Italy, 400 of these D-65 NAL type Diesel-engined buses have been ordered by the City of Buenos Aires. With a maximum speed of about 44 mph, this bus can accommodate 30 passengers.

will close down. It is believed, too, that orders for new cars will fade, although this has not as yet taken shape. From reliable sources, it is learned that priorities will be established for the purchase of new cars for persons engaged in essential work. Meanwhile, Minister of Supply Wilmot has met with British manufacturers and emphasized the necessity of further standardization, reduction in number of models, and exportation of 75 per cent of their output. Manufacturers are considering the proposals. Obviously, if these suggestions are adopted they will change the entire set-up of the British industry.

Crosley Car Production Far Above Prewar Level

While the production of Crosley passenger cars and pick-up trucks remains a small segment of the automobile industry's production, the output is considerably above the prewar level. Since production started in May, 1946, the company has built more than 15,000 passenger cars and 1500 pick-up trucks. In the period between 1939 and 1942 Crosley turned out approximately 6000 cars.

Willys Light Passenger Car Deferred Indefinite Period

The latest information indicates that the small light passenger car being planned by Willys-Overland Motors, Inc., is still in the future. The company apparently is committed to extension of its Jeep line with a deluxe station wagon, to be known as the Jeep Station Sedan, scheduled for announcement early next year. According to present plans, it will have a six-cylinder engine, passenger car interior and will be painted in solid colors with a wickerwork decal around the side. Another new vehicle in the Jeep line, which probably will be announced early next summer, will be the Jeepster, a small open two-seater built along convertible cabriolet lines.

New Nash Plant To Be Opened in Toronto

A new automobile plant employing about 1500 men, and capable of producing 100 cars a day, is scheduled for Toronto, Canada, in the near future, it was announced recently by H. Clay Dawes, vice-president and general sales manager of Nash Motors, Ltd. Shortages of steel and equipment may delay plans to convert the old Ford plant, now owned by Nash, but a parts distributing center will open there on Oct. 1, and remain in operation until the changeover to the new assembly plant is completed.

Car Dividends Down 37% in Second Quarter

Despite a slight increase in July, publicly reported cash dividend payments by the automobile industry for the three-month period ending July 31 decreased 37 per cent over the comparable period last year, according to the Department of Commerce. Reported 1947 payments for the three-month period totaled $24,800,000 as against $39,100,000 last year. Dividends reported during July 1947 amounted to $4,200,000 in comparison with $3,300,000 in 1946.

Marshall Plan Not Expected To Require Many U.S. Trucks

If and when the Marshall plan becomes an actuality, it will not draw very heavily upon truck production in this country, in the opinion of State Department advisers, according to AMA. The Inland Transport Committee of the European Economic Conference reported recently that production of trucks in Europe during the next four years is expected to total 1,297,000 units, with needs estimated to be only 1,175,000. AMA also says that reports of South American countries attempting to buy up large numbers of trucks in this country in anticipation of diversion of large quantities of American trucks to Europe under the Marshall plan is not borne out by a

Jeep Conveyor

Expected to increase production efficiency 25 per cent, this flight conveyor, recently installed on the main Jeep assembly line at Willys-Overland Motors, Inc., consists of an endless chain which receives vehicles after the body and wheels have been mounted. Propelled over a work pit 140 ft in length, arranged to permit quick and easy under chassis assembly, Jeeps are being produced in ever-increasing quantities.

survey of activities of South American economic missions. Although the Brazilian government recently closed a contract for 53,000 American trucks—General Motors and Ford supplying 18,000 each and 17,000 by other manufacturers—other South American countries have not gone overboard on truck purchases.

Chevrolet Van Nuys Plant Assembles First Truck

Although not as yet officially open, General Motors Corp.'s Chevrolet Motor Div., recently produced the first truck in its new assembly plant in Van Nuys, Cal. Scheduled for dedication later this fall, the plant will start car assembly when fully completed.

Test Flettner 282

Of radical design, a captured German Flettner 282 helicopter is now being tested by the Prewitt Aircraft Co., Wallingford, Pa., for the AAF. Similar to the AAF XR-8, the Flettner 282 features two intermeshing contra-rotating two-bladed rotors, mounted so that one axis forms a 24 deg angle with the axis of the other. The right hand rotor revolves clockwise, and the left hand rotor counter clockwise, eliminating the effect of torque reaction, it is claimed. Described as extremely maneuverable, the helicopter is reported to climb 300 fpm and have a maximum speed of 90 mph.

Bendix Buys Skinner Purifiers

The Bendix Aviation Corp. has purchased the assets of Skinner Purifiers, Inc., Detroit, pioneer in the field of automotive filtration equipment. To be operated as a new division of Bendix, the Skinner Purifier Div., the filter firm has been doing a $1 million business annually.

Chrysler's Brazil Distributor Builds New Assembly Plant

The Companhia Distribuidors Geral Brasmotor, distributor of Chrysler Corp. products in Brazil, is constructing a new assembly plant near Sao Paulo. The company has started to occupy the new building, which is about 40 per cent completed and which will occupy about 31,000 sq yd when finished. The company is financed entirely by local capital and has about 70 dealers throughout Brazil. It buys the component vehicle parts from Chrysler, and assembles cars and trucks according to Chrysler specifications. It does its own painting, finishing, upholstering, and other assembly work and sells the completed vehicle through its distributing organization. Dodge, Fargo and DeSoto trucks are being built currently and Chrysler passenger car lines soon will be in production.

Motor Vehicle Factory Sales from U. S. Plants*

	Passenger Cars	Trucks	Buses	Totals 1947	1946	1941
January	246,605	99,818	1,273	347,696	101,857	499,448
February	267,015	105,042	1,303	373,360	93,042	484,891
March	301,525	118,234	1,421	421,180	124,003	510,122
April	314,765	106,984	1,650	423,399	214,350	464,301
May	284,357	96,430	1,853	382,640	243,104	518,746
June	307,124	91,810	1,628	400,562	201,902	520,892
July	279,459	97,818	1,806	379,083	297,633	445,784
Total—Seven Months	2,000,850	716,136	10,934	2,727,920	1,275,901	3,444,184

Factory Sales to Domestic and Foreign Markets*

	Passenger Cars		Trucks		Buses	
	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign
January	226,695	19,910	77,434	22,384	1,115	158
February	245,081	21,934	83,276	21,766	1,090	213
March	280,018	21,507	92,082	26,152	1,272	149
April	291,953	22,812	83,515	23,469	1,465	185
May	261,240	23,117	75,696	20,734	1,599	254
June	284,576	22,548	73,803	18,007	1,409	219
July	257,709	21,750	78,505	19,313	1,694	112
Total—Seven Months	1,847,272	153,578	564,311	151,825	9,644	1,290

* Data from Automobile Manufacturers Association. July data are preliminary and subject to revision.

Ford Separates Service Unit From Parts and Accessories

Ford Motor Co. has divided its service and parts and accessories sales departments into two separate units. Hereafter, parts and accessory sales will be concentrated in one department with the service department a separate unit. Both remain under the jurisdiction of the sales department. I. L. Pearce has been made director of the service department, and A. B. Pease will continue to direct parts and accessory sales. The action follows separation of the two functions by the Lincoln-Mercury Div. a few weeks ago.

Army Urges Military Truck Use by Local Governments

AMA reports that Col. C. Elford Smith, Chief of the Automotive Div. Development and Proof Services, Aberdeen Proving Grounds, has proposed that federal and state governments use military type trucks and other vehicles to provide the country with an up-to-date motor fleet ready for instant service in time of emergency. Writing in *Ordnance*, journal of the Army Ordnance Association, Colonel Smith suggested that the added cost of building and operating military type equipment should be subsidized by the War Department. He said that there are 239,902 automotive units owned by the federal and state governments and that if 40,000 of the latest military units were subsidized annually, 200,000 would be available in five years, enough to equip a striking force. He said another advantage would be that manufacturers would not be requested to produce a few pilot models at a possible loss, but rather would be given an opportunity to produce thousands of subsidized vehicles at a possible profit.

Ford Installs New Type Of Fresh Air Car Heater

Ford Motor Co. has announced the development of a new type of fresh air combination ram and blower car heater which is now being installed on current production. Air is scooped through an intake in the radiator grille and the combined forcing of a powerful blower and the ramming effect of the vehicle speed, forces warm air into the car. Ford says that the pressure built up inside the car tends to prevent cold air from entering through cracks or openings. Through the increased circulation, window fogging is greatly reduced, and icing of the windshield is prac-

tically eliminated because twice the usual volume of hot air is routed through the defroster vents. The air is heated by passage over a high efficiency copper core through which hot water is circulated.

Chrysler First to Adopt New Low Pressure Tire

Chrysler Corp. is the first automobile manufacturer to adopt the new low pressure tire as standard equipment. It will be first used on eight-cyl Chrysler models. The tire which operates at 24 lb pressure and carries 26 to 27 per cent more air volume was announced recently by Goodyear Tire and Rubber Co. The new tire will be put on other Chrysler lines as soon as production conditions permit. It is expected that the low pressure tire will be used by most companies on 1948 models.

Introduce Lloyd 650 New English Two-Stroke

Lloyd Cars, Ltd., England, have recently introduced the Lloyd 650, powered by a 650 cc vertical, two-stroke, twin cyl engine which produces 17.5 bhp at 2450 rpm. An unusual feature is a charging pump, located at the rear of the engine, which is said to provide good pulling power and fuel economy in this front wheel drive car.

Treasury Suggests Lifting Federal Tax on Gasoline

A recent Treasury Department study has suggested federal withdrawal from motor fuel taxation in return for state withdrawal from another field of taxation, as yet unnamed. The study points out that the federal gasoline tax was an emergency depression measure, limited to one year, 1932, a dozen years after the states had occupied this field of taxation. The study also reviews coordination proposals which generally favor withdrawal of the federal government from this field. The question of federal abandonment of other automotive excises is not discussed, since this subject will be the topic of another study not yet completed.

Car Builders Buy Billets For Outside Mill Rolling

One practice reportedly used by automobile manufacturers to augment limited sheet steel shipments is purchasing steel billets, and having them rolled at any outside rolling mill that can be found with open capacity. The practice is much costlier than purchasing the sheet steel direct, but it is a stopgap emergency measure, considered worthwhile in order to help keep the production lines going.

K-F Uses New Steering Gear Patterned After Truck Type

Kaiser-Frazer Corp. reveals that it is using a new type of steering gear which is an adaptation of heavy duty types normally used in buses and trucks. The gear is made by Gemmer Mfg. Co., and uses a triple tooth roller gear which replaces the double tooth design used in prewar steering units. The third tooth is said to relieve internal gear pressure, to allow greater leverage in the steering linkage, and to give the driver improved steering control and stability.

Union '48 Wage Drive May Raise Car Prices Again

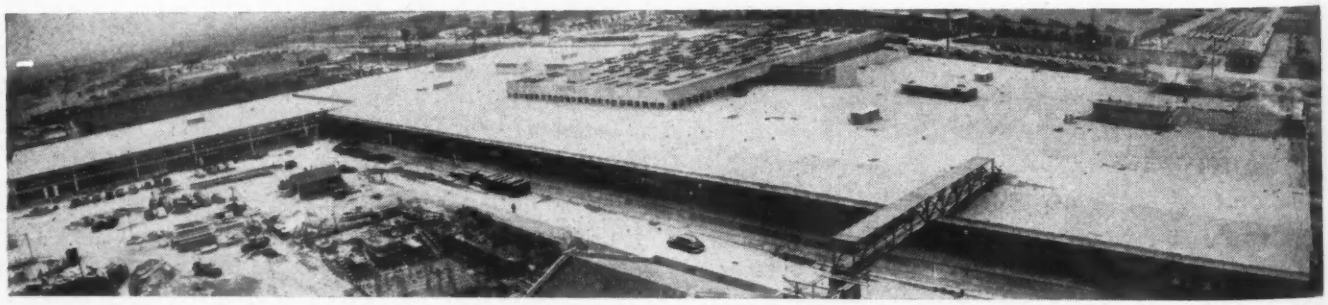
There is considerable opinion in Detroit that the latest round of price increases on automobiles will not be the last. UAW-CIO has hinted that it will plug for another round of wage increases next spring which, undoubtedly, would lead to a boost in automobile prices. There is also some belief that the introduction of new models will result in very heavy tooling expenditures, at least for some companies, which again would tend toward increased prices. Higher freight rates are in prospect as a result of the wage increase just granted rail workers, which would be one more cost factor influencing higher car prices.

Report Canada Considering U.S. Car Import Restriction

The automobile industry is watching for a possible restriction of imports of automobiles into Canada. It is said that the Canadian Trades Department is compiling a list of products which may be restricted if the government decides to conserve dwindling American dollar reserves. Automobiles are said to be one of the items that may be on the list.

Curtiss-Wright Shows Flying Freight Train

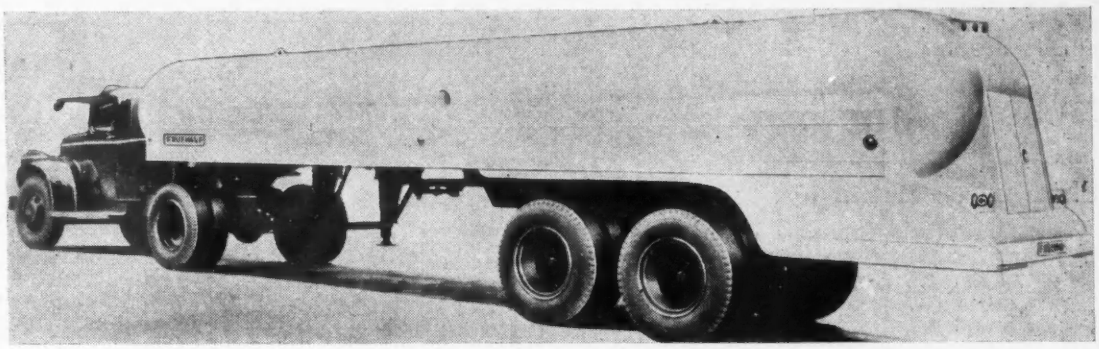
The Curtiss-Wright Corp. has exhibited a mock-up of a freight plane which is designed to carry 16 tons of cargo at 300 mph from coast to coast, at an estimated operating cost of four cents a ton-mile. Designated the C-W 32, the plane is 89 ft long and 32 ft high, and can carry units up to 48 ft long, nine ft wide, and



For West Coast Lincoln-Mercury Assembly

Now being constructed in Los Angeles for the Ford Motor Co., this new Lincoln-Mercury assembly plant will ultimately have 426,000 sq ft of floor space, and at peak production will produce about 250 passenger cars daily. Providing employment for 1500 persons, this one-story building will cost $4 million.

Hauls Propane



Especially designed for hauling propane, this streamlined tank trailer, developed by Fruehauf Trailer Co., is available in either single or tandem-axle under construction in sizes ranging from 3500 to 6000 gal.

seven ft high. It is powered by four engines with a total of 8400 hp, and Curtiss reversible electric propellers are employed.

Ainsworth Gets Boat Plant For Expanded Parts Output

Ainsworth Manufacturing Corp., Detroit automotive parts manufacturer, has acquired the Gar Wood Industries Boat Div. factory at Marysville, Mich. R. J. Purdy, president and general manager of Ainsworth, says that the new plant will be in full production by next January and will be used to build automotive parts, including ventilators, window assemblies, seat slides, windshield regulators and grilles.

Personal Aircraft Sales Dip To Lowest Point in 13 Months

Personal aircraft shipments by twelve companies were the lowest during July for 13 months since monthly reports were started in July 1946. The 991 planes shipped in July represented a drop of 13 per cent from the June total. Stinson Div., Consolidated Vultee Aircraft Corp. was sales leader in July for the third straight month with 230 planes, six more than in June. Second largest July seller was Piper with 172 planes. Beech was third with 155.

United Aircraft Buys Facilities for $20 Million

The United Aircraft Corp., has purchased all of the government-financed buildings at East Hartford, Conn., for $20 million, with the exception of the building additions built for the Chance Vought Aircraft Div., by the Government. The purchase included buildings, machine tools, shop equipment and miscellaneous office and other equipment, which originally cost, it was reported, $56 million.

Kaiser Boost Restores Part of Dealer Discount Cut

A part of the $100 discount cut put in effect last June on the Kaiser automobile has been restored coincident with the recent $99 increase in the retail price. It is reported that Kaiser-Frazer dealers have been allowed $50 of the increase.

Henry Ford II to Address Parts Makers September 29

Henry Ford II, president, Ford Motor Co., will be the principal speaker at the annual meeting of Automotive and Aviation Parts Manufacturers, Inc., September 29, Cleveland. It will be the first time the annual meeting has been held outside Detroit. About 800 representatives of automotive parts, passenger car, truck, and tire companies are expected to attend.

Std. Oil of Calif. Buys Gasoline Refinery

The Standard Oil Co. of California has purchased for $6 million the 15,000-bbl, 100-octane, surplus gasoline refinery at Richmond, Calif., which it operated for the government during the war. The plant had an original cost of slightly more than $21 million, and all facilities were on land owned by Standard. It is estimated that installation of additional equipment and improvements will increase the capacity to 20,000 bbl or more a day.

High Tensile Steel For Hudson Body Parts

A shortage of regular carbon steel sheets for many body parts has resulted in a substitution by Hudson Motor Car. Co. of high-tensile low-alloy steel. Bumpers, fenders, radiator grilles, rear bumper

New Truck Registrations*

June and six months 1947 compared with 1946. Arranged by makes in descending order according to the six months' 1947 totals.

Make	June 1947	May 1947	June 1946	SIX MONTHS Units 1947	SIX MONTHS Units 1946	SIX MONTHS Per Cent of Total 1947	SIX MONTHS Per Cent of Total 1946
Chevrolet	9,206	15,689	15,816	104,814	46,482	24.20	20.12
Ford	17,485	18,939	4,579	102,842	54,298	23.75	23.50
Dodge	10,709	11,952	8,796	64,584	45,275	14.91	19.59
International	8,929	10,616	6,249	54,213	30,781	12.52	13.32
G. M. C.	4,924	4,976	1,093	27,500	5,742	6.35	2.48
Willys	4,642	4,112	3,742	20,657	15,056	4.77	6.52
Studebaker	3,415	3,745	2,447	20,478	7,719	4.73	3.34
Reo	1,121	1,373	545	7,212	3,658	1.67	1.58
White	981	1,271	761	6,516	4,587	1.51	1.99
Diamond T	811	920	167	5,027	2,811	1.16	1.22
Mack	848	925	287	4,798	3,691	1.11	1.60
Federal	475	452	372	2,752	2,043	.64	.88
Autocar	342	388	373	2,416	1,997	.56	.86
Divco	433	425	257	2,354	1,759	.54	.76
Brockway	282	330	255	2,146	1,758	.50	.76
Hudson	304	282	345	1,817	1,201	.42	.52
F. W. D.	104	73	43	638	272	.15	.12
Ward La France	40	34	.....	289	.....	.06	.....
Sterling	49	58	41	288	276	.06	.12
Oshkosh	16	19	.....	120	.....	.02	.....
All Others	342	320	320	1,617	1,662	.37	.72
Totals	65,458	76,901	48,488	433,080	231,068	100.00	100.00

* Data from R. L. Polk & Co.

guards, and dust shields are included among the items for which this more costly steel is being substituted.

Soss Manufacturing Plans Large Expansion

Soss Manufacturing Co., automotive parts manufacturer, is planning construction of a new plant that will add approximately 50,000 sq ft to present manufacturing space. The plant will be erected on the present factory site. Soss manufactures hinges for the automotive parts industry.

Shipments of Aircraft Engines and Other Products of Aircraft Engine Plants, 1947*

	June	May	Six Months
Aircraft Engines			
For U. S. Military			
Number	346	387	2,296
Value	$19,822,043	$19,495,084	$101,842,618
Parts, Value	$5,119,330	$2,971,172	$16,377,614
For Other Than U. S. Military			
Number	1,002	1,773	11,997
Value	$5,249,333	$5,008,286	$33,735,067
Parts, Value	$2,755,762	$3,088,994	$17,847,528
Total—Engines			
Number	1,348	2,160	14,293
Value	$25,071,376	$24,503,370	$135,577,685
Parts, Value	$7,875,092	$6,930,166	$34,225,142
All Other Products, Value	$217,800	$552,961	$2,923,066
Total Value, Engines and Parts	$33,164,268	$31,116,497	$172,725,893

* Bureau of the Census and Civil Aeronautics Administration.

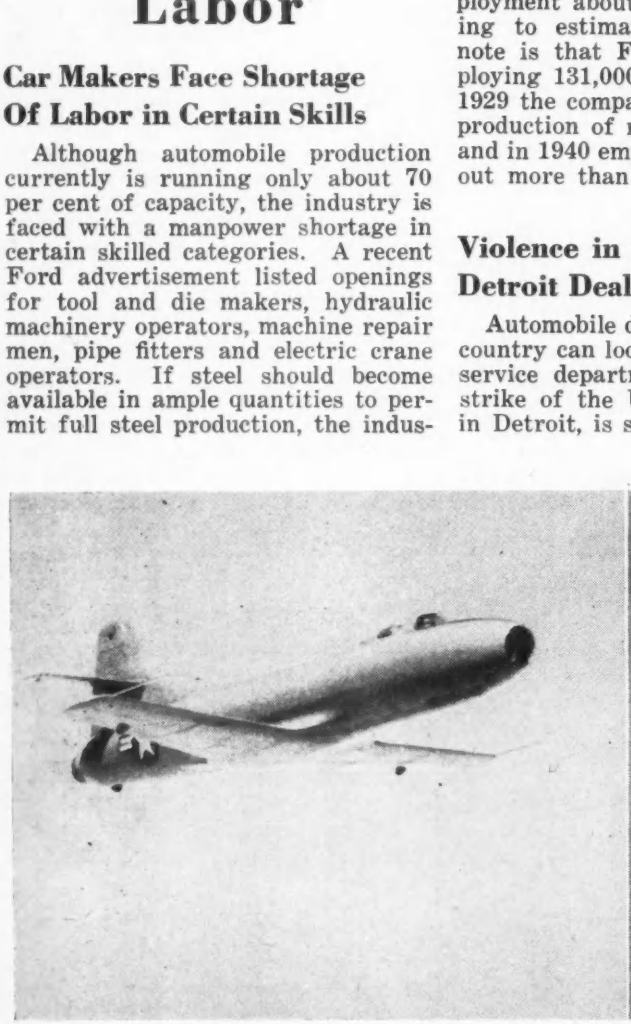
Labor

Car Makers Face Shortage Of Labor in Certain Skills

Although automobile production currently is running only about 70 per cent of capacity, the industry is faced with a manpower shortage in certain skilled categories. A recent Ford advertisement listed openings for tool and die makers, hydraulic machinery operators, machine repair men, pipe fitters and electric crane operators. If steel should become available in ample quantities to permit full steel production, the industry would be required to increase employment about 20 per cent, according to estimates. An interesting note is that Ford is currently employing 131,000 workers whereas in 1929 the company had 162,270 for a production of nearly 2 million units and in 1940 employed 132,284 to turn out more than a million vehicles.

Violence in Strike of Detroit Dealers' Mechanics

Automobile dealers throughout the country can look for trouble in their service departments, if the current strike of the UAW-CIO, Local 415, in Detroit, is successful. The union has shut down nearly 80 automobile and truck dealerships in the Detroit area operated by Ford, Lincoln-Mercury, Chevrolet and Buick dealers. The early days of the strike were marked by violence and flying squadrons of goons who invaded two dealerships in an attempt to intimidate reluctant mechanics. In addition to demands for a guarantee of $2 per hour, or 60 per cent of the customer labor bill, whichever is higher, and other economic concessions, the union is attempting to get a blanket agreement covering all dealerships whether or not the dealers are willing to negotiate separate contracts. The dealers say that the union demands are excessive and that if



Skystreaking at 650.6 mph

The U. S. Navy captured the international air speed record recently when Maj. Marion Carl, Marine Corps, piloted the jet propelled D-558 Douglas Skystreak, shown above, at an average speed of 650.6 mph in four runs over a three km course at Muroc Army Air Base, Calif. Cdr. Turner F. Caldwell had previously piloted the Skystreak at an average speed of 640.7 mph. Built for the Navy by Douglas Aircraft Corp., the Skystreak is powered by a GE TG-180 axial-flow jet engine, with a 4000 lb. thrust.

granted would raise the wages of top mechanics to about $200 a week.

Foremen Hit by NLRB Dismissal

The fight by foremen for collective bargaining rights is apparently about dead. NLRB recently dealt the foremen another blow when it dismissed 50 election cases involving 5400 foremen and 12 unions seeking to represent them in collective bargaining. Included among the cases dismissed were those against Chrysler Corp., Gar Wood Industries, Inc., and Houdaille-Hershey Corp. The Board said it has no jurisdiction over collective bargaining by supervisory workers under the Taft-Hartley law.

Silvaire Preview

Previewed recently, Luscombe Airplane Corp.'s new four-place Silvaire is powered by a 165-hp engine. A high-wing, multi-purpose, all-metal plane, the new Silvaire is reported to have a cruising range of over 500 mi, a cruising speed of about 130 mph, and can carry a cargo load of 600 lb. in addition to the pilot and a full load of gasoline in the two wing tanks.

Reo and Murray Settlements Fix Union Responsibilities

Although the agreement between Murray Corp., and UAW-CIO that ended the 28 day old strike was hailed by the union as a victory, critical examination reveals that it was considerably less than that. Actually the union is relieved from legal liability under the Taft-Hartley law only as long as it meets definite obligations. The agreement provides that there will be no slowdowns or sitdowns while it is in effect. The union also agrees that there will be no strikes over production standards and management rights as specified in the agreement or any attempts to amend the agreement while it is in effect. In the event that it authorizes a strike on any one of these three issues the union is liable. It is also held responsible if it authorizes a strike not specifically prohibited until the agreement's grievance procedure has been exhausted, the strike has been authorized by the international union, and at least 45 days have elapsed after the filing of the agreements. In the event of a wildcat strike, the union agrees to provide the company with a notice that will tell employees that the strike is unauthorized, and will order the men to return to work and to cease any action which might affect production. If the union fails to take such action it is subject to legal liability. The company also has the right to take disciplinary action against employees who are involved in wildcat strikes. The union has a right to appeal the disciplinary action through grievance procedure, but cannot strike over the issue within 45 days.

Reo Motors, Inc., has concluded an agreement with the union which is more stringent than the Murray settlement. The union promises, in the event of a wildcat strike, that it will "not give any aid, encouragement, support or assistance including use of any union facilities or financial support to the violators or in furtherance of such violation." The union also agrees to disavow the action by a public notice to all members within 24 hours, and to direct all its members to return to work. If any worker fails to return to the job when called by the company, he is considered a voluntary quit and under the contract has no further rights. Another condition of the financial immunity granted to the union is that disputes be submitted to arbitration with the umpire's decision to be final. In the case of a wildcat strike, the company is free to cancel the entire agreement.

Shipments of Complete Aircraft and Other Products of Aircraft Plants, 1947*

	June	May	Six Months
Complete Aircraft	1,332	1,740	11,427
For U. S. Military			
Number of Planes	139	94	685
Value of Planes and Parts	$64,073,206	$37,326,323	$250,363,425
For Other Than U. S. Military			
Number of Planes	1,193	1,646	10,742
Value	$20,652,983	$19,048,051	$88,535,674
Under 3,000 pounds			
Number	1,164	1,618	1,278
Value	$4,541,835	$5,641,249	$35,756,439
3,000 pounds and over			
Number	29	26	143
Value	$16,111,148	$13,404,802	$52,779,235
Parts for Other Than U. S. Military	$2,150,728	$1,378,460	$9,553,906
Conversions			
Number of Planes	14	21	131
Value	$1,150,000	$2,318,203	$11,799,631
All Other Products, Value	$2,630,657	$2,901,181	$16,612,788
Total Value of Products	$90,657,574	$62,970,218	$376,865,424

* Bureau of the Census and Civil Aeronautics Administration.

Metals

Copper

Demand for copper continues to outrun supply, and producers are now pointing for October business, with September copper fairly well sold. However, some wire and cable producers, unable to obtain steel among other materials, have pushed back deliveries. With higher tonnage orders expected in October, deliveries then should run higher than in September. Brass mills report that October rod and sheet deliveries should be heavier than September.

(*Turn to page 47, please*)

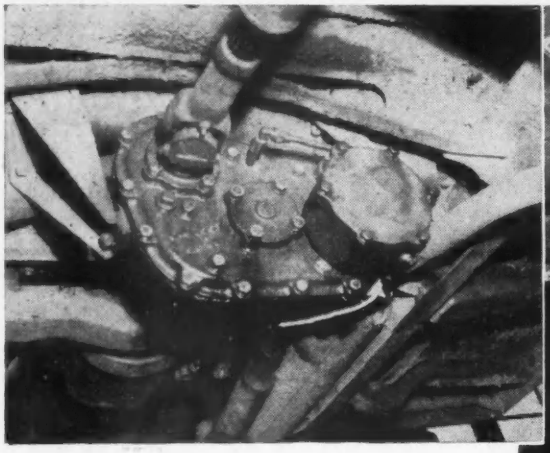


Fig. 2. Ransom overrunning clutch installed on a ¾ ton 4 x 4 truck.

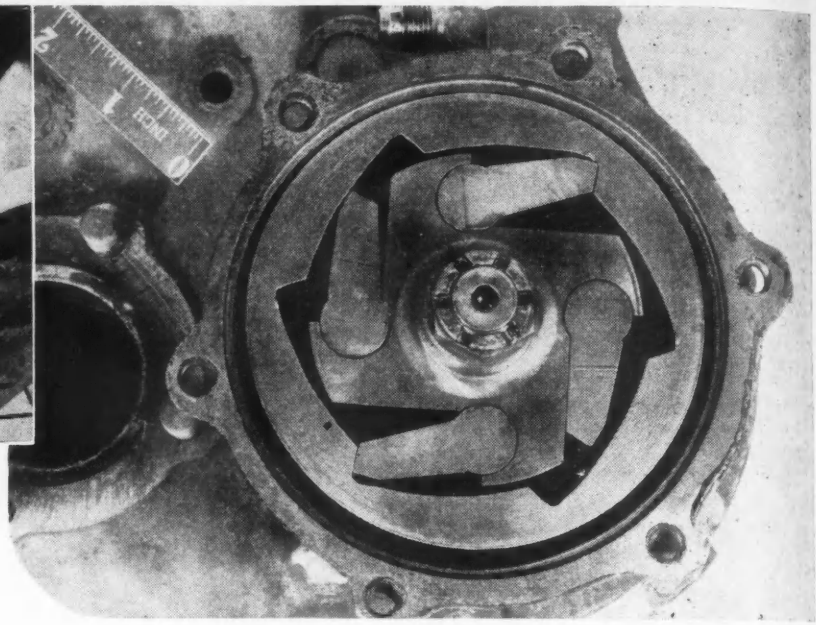


Fig. 1. Details of the Ransom overrunning clutch (cover plate removed). Latch springs had not been inserted before this picture was taken.

Ransom Drive System

Designed to Improve Efficiency of

DESIGNED to eliminate "wind up" in the power train of multi-wheel drive vehicles and to decrease steering radius, the Ransom drive system, after having been tested by Army Ordnance, is now undergoing further field tests by Army Ground Forces prior to initial procurement.

Incorporating an overrunning clutch drive of the steered wheels and non-constant velocity universal joints at the steering knuckles of the drive-steer axles, this new system was invented by Richard R. Ransom, consulting engineer, and developed under the sponsorship of the National Inventor's Council. The device was installed on a Dodge 4x4, ¾ ton truck at Aberdeen Proving Ground and under Ordnance direction underwent road tests totaling more than 10,000 miles. The following description of the mechanism and its operation has been provided by Mr. Ransom.

The overrunning clutch, Fig. 1, is installed on the transfer case front wheel drive shaft as shown in Fig. 2. It permits the front and rear wheels to turn at different speeds and yet drive the front wheels at all times except when the clutch overruns. Provision is also made to lock out the overrunning clutch for reverse operation in soft ground where four wheel drive is imperative, since the ratchet drive of the clutch continually overruns in reverse.

In ordinary vehicles it is evident that the front or steered wheels travel with a longer radius from the center of turn of the vehicle and therefore go faster during a turn than do the rear or unsteered wheels. With a conventional solid connection between front and rear wheel drives, this causes slippage of either front or rear wheels or both, considerable tire wear, strain between parts of the drive system, and some loss of power, to the extent that with equal loading of front and rear wheels and a front wheel steering deflection of 28 deg, approximately one-eighth or more of the total driving power of the vehicle is lost in the "wind-up" in this type of 4-wheel drive. This ratio of lost driving torque increases rapidly with larger angles of steering deflection, and is nearly one-fifth of total power at 35 deg deflection, and approximately one-fourth of total power at 40 deg. At 45 deg, which with a rear wheel drive vehicle is about the limiting angle of effective steering deflections, the loss of power in the 4-wheel drive vehicle would be nearly one-third.

Applications of Ransom Drives

Each drawing of Fig. 3 illustrates one form of Ransom drive in which the one or two non-steered axles are driven directly and positively from the transmission 5 by the propeller shaft; and each drive-steer axle is driven from the transmission through a transfer case 6 enclosing an overrunning clutch with its reverse locking device through a propeller shaft. There is a non-constant velocity universal joint in each steering knuckle of the drive-steer axles. The center of turn CT is located by the intersection of lines 1, defining

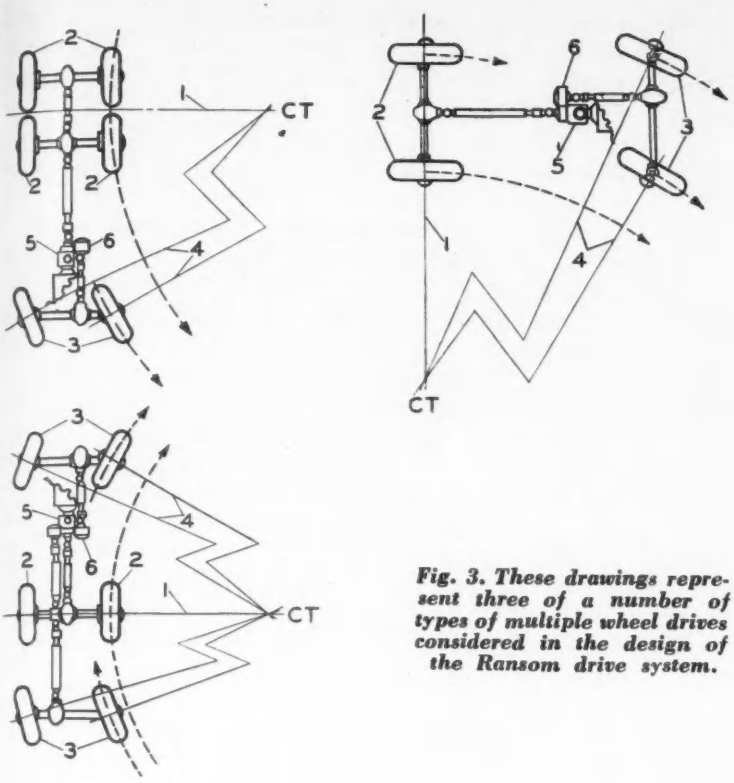


Fig. 3. These drawings represent three of a number of types of multiple wheel drives considered in the design of the Ransom drive system.

Multiple Wheel Drive Vehicles

the line of centers of the wheels 2, and the lines 4 defining the axes of the drive-steer wheels 3. The paths through which the moving wheels 2 and 3 will roll about the centers CT are outlined in dotted lines. The angles at the centers of turn between the line 1 and the lines 4 are evidently the same as the angles of steering deflection given to the drive-steer wheels 3.

When one of the vehicles illustrated in Fig. 3 is driven in a straight line, that is, with drive-steer wheels 3 given a zero deflection from a line parallel with the axis of the vehicle, the propeller shaft to the differential of the non-steered axle is driven positively at the speed of the final drive of the transmission, and the propeller shaft to the differential of the drive-steer axle is driven positively through the overrunning clutch within the transfer case at a speed equal to the speed of the final drive of the transmission, but the propeller shaft (or shafts) to the differential of the drive-steer axle is also free to overrun this speed of the final drive of the transmission although it will not receive, from the driving torque transmitted to it from the transmission through the overrunning clutch, any impulse whatever to overrun this speed. So long, therefore, as no steering defections are given to the drive-steer wheels and the vehicle proceeds in a straight line course, the driving torque of the vehicle is transmitted substantially equally to all wheels.

In case any wheel or the wheels of any axle have insufficient traction to deliver their proportion of the driving torque so that slippage would occur with a vehicle driven in the conventional manner, the slippage that occurs will be limited to the infinitesimal amount necessary to transfer the excess torque to other non-slipping axle or axles, and the full driving torque of the vehicle will still be delivered with no wheels slipping, but with the firmly supported wheels taking the excess effort or torque not taken by the low traction axles and the low traction axles or axle taking the full tractive effort it can exert just short of the effort that would cause it to slip. That is, the vehicle wheels will not slip individually when they come into conditions of low tractive resistance, but the overrunning clutch to the steer-drive wheels and positive drive to the non-steered wheels will continue to drive all axles at the same speed and prevent slippage of any wheel and loss of driving torque unless every axle of the vehicle should simultaneously have one or more wheels with low tractive resistance. Furthermore, since power is delivered simultaneously to all wheels of the vehicle, there is no tendency whatever for the rear wheels of the vehicle to slip under the driving torque more readily than the front wheels as would be the case with a rear-wheel driven vehicle or with certain 4-wheel drive vehicles when the front wheel drive is not engaged. No differential due to driving torque could be built up between the motion of the drive-steer wheels and the non-steered wheels while the vehicle is driving straight ahead.

When the vehicle (Fig. 3) goes into a curve, that is, when the drive-steer wheels are given any steering deflection, the path through which the vehicular wheels travel requires that the drive-steer wheels move farther than the non-steered wheels, and that the universal joints in the steering knuckles of the drive-steer axles will operate at the same angular deflection given the drive-steer wheels rather than a straight line. In each drawing of Fig. 3 the speed of drive-steer wheels and of non-steered wheels is proportional to the radii by which they are respectively distant from the center of turn, since so long as the angles of deflection given to the drive-steer wheels are unchanged the vehicle will move about the center of turn as a unit, and every part of the vehicle will move through the same angular magnitude about that center. That is, if the distance of the non-steered wheel from the center of turn is taken as unity, the rolling speed of any drive-steer wheel on the same side of the vehicle is equal to the speed of the non-steered wheel multiplied by the secant of the angle between the radii which lie along the lines

1 and 4. This angle is equal to the angle of deflection given to the drive-steer wheel 3, or the angle between the driving axis of the drive-steer axle and the driven axis of the non-constant velocity joint.

Now the drive-steer axle and the non-steered axle are driven positively at the same minimum speed, as shown in the preceding paragraph, but with the drive-steer axle also freed by the action of the overrunning clutch to move faster than the speed given to it by the positive drive from the transmission. Whenever the drive-steer wheels are driven positively at a minimum speed equal to or less than the speed at which they must move about their curved path, the action of the overrunning clutch allows the drive-steer axle, or axles, to overrun the speed transmitted positively to them and move freely at the rate of speed necessary to cover the path of their curve.

If the eccentric action of the non-constant velocity joint in the steering knuckle of the drive-steer axle does not at any phase of its action, when the drive-steer wheels are given any steering deflection, drive the drive-steer wheels faster than their free rolling speed in the curve, then no fight or conflict between the motions of the non-steered wheels and the drive-steer wheels can be set up in the drive system connecting them. By comparing the formula for the free rolling velocity of the drive-steer wheels as given, and the formula for the maximum eccentric action of the non-constant velocity universal joint as it drives the drive-steer wheels from the drive-steer axle, we find that the two formula involve the same angles and produce identical speeds; and that the use of non-constant velocity joints in the drive-steer axles cannot in any case overdrive the drive-steer wheels.

While the vehicle is making a turn and its drive-steer wheels are deflected in steering, the vehicle is being driven by the non-steered wheels during the part of each revolution of the drive-steer wheels in which the eccentric action of the non-constant velocity universal joints do not drive the drive-steer wheels at a rate as rapid as their free rolling velocity about the curve. During these periods the overrunning action of the overrunning clutch allows the drive steer wheels to overrun the rate at which they would otherwise be driven and to take on the full free rolling velocity required. Twice in each revolution of the non-constant velocity universal joint and of the drive-steer wheel the drive-steer wheel will be driven precisely at the speed of its free rolling velocity, however. It should be noted also that no pulsation or irregularity in the delivery of driving torque can result from this instant in which the driving speed of the drive-steer wheels and their free rolling velocity is identical, since there is no tendency whatever to overdrive the drive-steer wheels beyond their free rolling velocity which they already have assumed in negotiating the curve.

If, however, there is any slippage of either non-steered wheel while the vehicle is negotiating a curve, the locking action of the overrunning clutch drives positively the drive-steer wheels at the same speed as the non-steered wheels. The slippage of a non-steered wheel or wheels is immediately limited to that proportion of its speed by which it would normally move more slowly than the drive-steer wheel or wheels, and the non-steered wheel or wheels deliver a reduced amount of driving torque up to the reduced tractive support which they still have. This condition will continue until non-steered wheels again reach stable tractive conditions, when full tractive effort will again be taken by non-steered wheels and free overrunning action of the overrunning clutch resumed.

Further, this action is not limited to small angles of steering deflection, but the same trigonometric relations hold unchanged for any steering deflections whatever, so that steering deflections of 45 deg or more are entirely practical.

Reverse Drive

When the vehicle is in reverse gear drive the locking device of the overrunning clutch, Fig. 4, is engaged in locking position by the action of the reverse gear shifting rod in the transmission or other automatic control means, so that the overrunning clutch is locked into one-to-one positive drive of both the non-steered wheels and the drive-steer wheels. Whether the transfer case is integral with transmission or is separate, the reverse gear shifting rail should be connected with a shifting fork operating the locking clutch to lock out the overrunning action of the rear drive shaft when the vehicle is in reverse gear drive. It is believed that because of the relatively small amount of time that any vehice is ordinarily driven with reverse drive, and also because of the fact that the reverse gear drive of a vehicle is commonly given a greater gear reduction and greater torque than other gears so that the loss of driving torque, greater tire wear, and strain set up because of the unequal motion of the front and rear wheel or of steered and non-steered wheels, can be disregarded in view of the greater advantages gained by the Ransom drive system.

While the experimental overrunning clutch discussed here has been installed as an auxiliary unit attached to the outside of the transfer case, designs for regular production will incorporate this whole new mechanism in the transfer case itself, or as is planned for future Army designs, it will be included as a part of a unit transmission and transfer case.

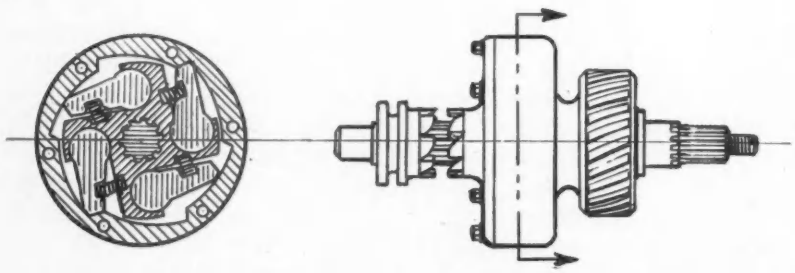
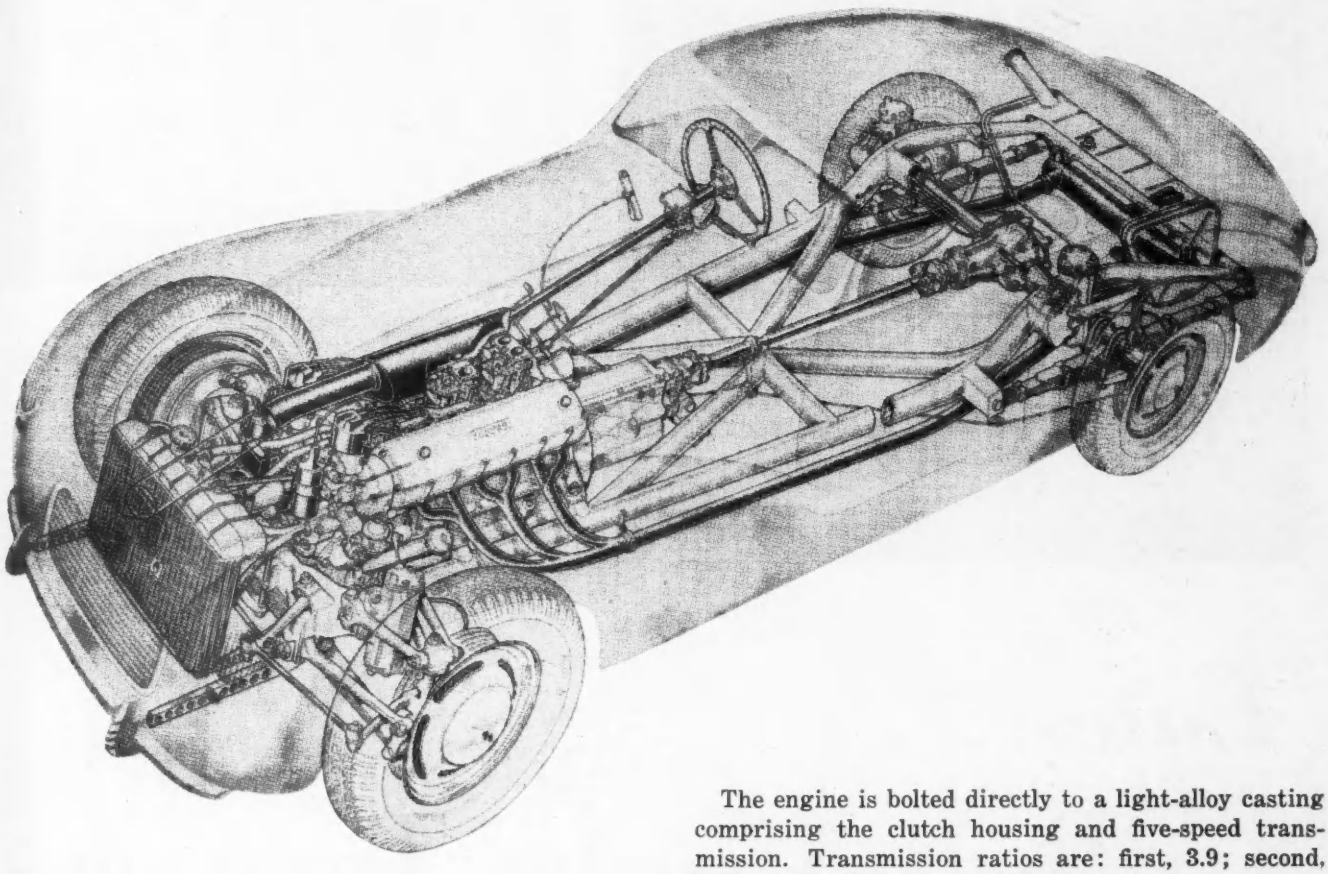


Fig. 4. Sectional and assembly views of overrunning clutch with driving gear and locking clutch on rear drive shaft of transfer case. This is the same type clutch as that shown in Fig. 1 and 2 but with a differently designed locking mechanism.

More Data

on the New Ferrari Car



SHOWN here are structural details of the new Italian sports car, the Ferrari 125-S, preliminary details of which were given in the Feb. 1 and Apr. 1 issues of AUTOMOTIVE INDUSTRIES. This car is powered by a V-12 overhead valve engine which is built in two blocks of six cylinders set at an angle of 60 deg. The bore and stroke are 2.16 in. and 2.06 in. respectively, which gives a total piston displacement of 91.3 cu. in, developing 72 bhp at 5600 rpm. Lubrication is by a submerged gear pump driven from the seven bearing counterweighted crankshaft. Oil is forced through a full flow series filter, then to the main bearings and through the drilled holes in the crankshaft to the connecting rod bearings, camshafts and camshaft chain which drives the water pump and generator. A thermostatically controlled bypass valve regulates the flow of oil to a cooler located on the side of the radiator. Damage to the oil cooler is prevented by means of a pressure relief valve which operates if the thermostat should stick.

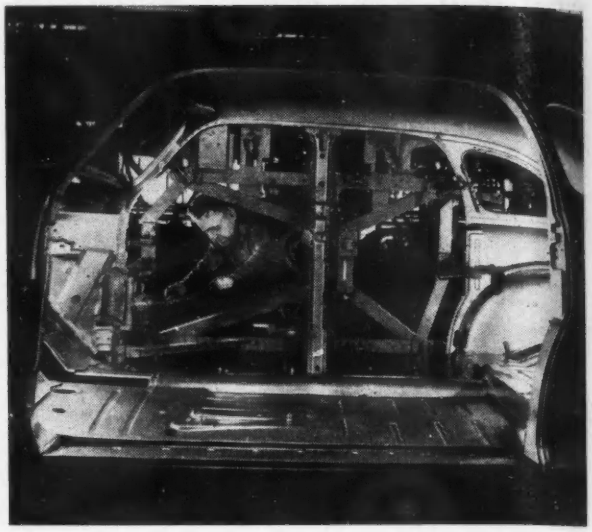
The engine is bolted directly to a light-alloy casting comprising the clutch housing and five-speed transmission. Transmission ratios are: first, 3.9; second, 2.22; third, 1.38; fourth, direct; fifth, 0.92; reverse, 3.97. The differential gear ratio is 4.9 to 1.

The three place single seat body with overall dimensions of 177 in. length, 61 in. width and 59 in. height has a minimum turning radius of 17 ft and a minimum road clearance of 6.5 in. The wheel base is 95.25 in., front tread 49.37 in., rear tread 4725 in. The chassis weight with five tires and tools is 1233 lb; complete vehicular dry weight is 1760 lb. The fuel tank capacity is 17 gal. Maximum speed is 96 mph, fuel consumption yields an average of 28 miles per gal.

The car is equipped with 4-wheel hydraulic service brakes which act on the inner annual surface of aluminum alloy 11.7 in. diam drums. The emergency brake operates on the rear wheels, actuating force being transmitted from a hand lever through flexible cables to the brake shoes. Wheels are Rudge type equipped with 500-15 tires.

In addition to other features the illustration shows the special air intake scoop that carries air from the front of the radiator to the carburetors, and the oval cross section steel tubing of the chassis.

(Below) The gate fixture, a portable unit, next is assembled in place to provide accurate alignment of sub-assemblies and to assure standard door opening. This fixture remains in place until the major welding operations have been completed.



(Left) Chevrolet bodies are integrated from sub-assemblies on this floor conveyor, the initial step being the installation of the underbody assembly on the truck fixture. At the point shown here, the front section sub-assembly has been fastened securely to the underbody and the operators are about to lower the balloon assembly which was welded together at an adjacent station.

Latest . . .

Body Assembly Techniques

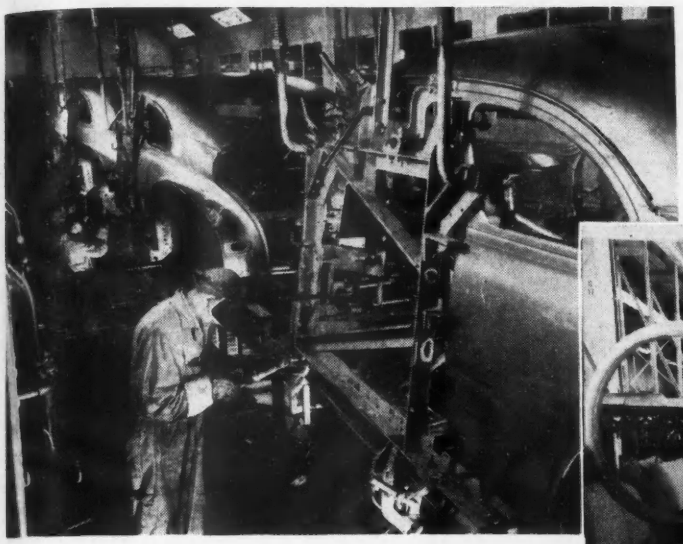
Spacious New Building in Michigan Is Completely Air Conditioned and Interior Lighted by System of Seven Miles of Fluorescent Tubes

CLOSELY coordinated with the new Chevrolet assembly plant on the outskirts of Flint (see AUTOMOTIVE INDUSTRIES, Aug. 15, 1947), is the new Fisher Body Division assembly plant which has been built into a self-contained section of the same building. At the present time Chevrolet requires bodies in ten different styles, with ten color options in combination with five trim options. Close coordination of work scheduling, and material procurement involving a total of more than 2100 different items is an important factor in maintaining the production schedule.

A typical Chevrolet Fleetline sedan body requires more than 3973 parts ranging from tacks and fastenings to the major body stampings. Of these, 403 fabricated sheet metal parts are received from other Fisher Body plants, some 380 items of hardware and fittings from Ternstedt, 252 trim and trim stock items from Fisher's Ionia plant, and more than 1000 parts purchased from outside vendors.

From start to finish a body is moved over two miles of conveyor lines, mechanization being developed to an amazing degree. For example, there are 10,503 ft of

(Below) Torch welds to secure the sub-assemblies to the underbody are made as shown here. Operators work in a pit in a comfortable position. The gate fixture can be seen in this view.



(Right) Suspended on an overhead pivot, this unique C-shaped fixture facilitates installation of the front seat frame in the body. The fixture is so arranged as to swing around to the seat monorail conveyor at the left, pick off a seat frame, and then swing it into the body.

By Joseph Geschelin

by Fisher

body conveyor lines; 585 ft of cushion conveyor lines; a 1380 ft cushion monorail delivery conveyor; and a 675 ft door delivery monorail. The second floor paint shop, at full production volume, consumes about 2800 gal of paint daily, distributing this through the various spray booths by four miles of Duco piping.

Being new from the ground up and having the advantage of the latest ideas in body assembly techniques, the building is spacious and completely air conditioned for the comfort of workers as well as for maintenance of conditions conducive to a quality paint job. Special attention has been given to the exhausting of heat and fumes from every section of the plant. Since it is recognized that good visibility is an important feature in body building, the most advanced lighting ideas have been translated into actual practice in this new plant. Good lighting is provided by a system of seven miles of fluorescent tubes. As an example of what can be accomplished, the trim shop is provided with a lighting intensity of 80 ft candles.

For maintaining quality level unusually high, Fisher has incorporated numerous sampling inspection procedures, several examples of which will suffice to show what is being done along this line. The most outstanding is the body water test. For this there is an enclosed booth fitted with nozzles and sprays for impinging streams of water under 80 psi around window and windshield openings, and around doors and the trunk lid. These vital points must be proof against the high pressure streams. Several roving inspectors select bodies off the final line at random and test them in the booth.

Another detail of vital importance is the sampling of windshield glass to assure good optical properties without distortion. Here again is a sampling inspection. Near the glass station, mounted on a column is a powerful bull's-eye light source. At regular intervals the inspector picks out a piece of glass, sights it at the bull's-eye and determines its quality. If any defects are found, the entire lot is inspected to cull out the bad glass.

The regular painting procedure is to give a double-prime coat, a double glaze, and two coats of Duco. Actually the number of coats is multiplied owing to the overlapping of the spray. It is estimated, for ex-

Engineering Library

ample, that a body will have practically the equivalent of four Duco coats before it is finished while the top may have from five to six coats owing to the overlapping spray. For finishing the top there is an automatic, cam-operated spray gun mechanism at the entry, and two semi-automatic spray gun machines at the exit end of the spray booth. Using three sets of guns, it is likely that overlapping will result in a multiple coating. Prior to painting, all bodies are Bonderized by passage through a large Bonderizing unit running 225 ft in length with the dry-off oven at the exit end held at 300 F.

The new powerful, extremely light, 360-cycle portable tools are used wherever practicable, power being supplied to them through a mile of high-cycle conduits.

Coming to a high-spotting of the operations that go into the integration of a Chevrolet body, we find that assembly is divided into three major sub-assemblies—the underbody, front end, and balloon assembly. The balloon assembly and front section are united in a massive framing fixture by using portable spot welders. The underbody is received in two floor pan sections, the first major operation being the joining of the two sections by spot welding, and the welding-on of the multiplicity of straps, reinforcements, and brackets. In every case, the welding operation is provided with a suitable exhaust duct to draw off the fumes.

The welding jig for the underbody marks the first operation on the body assembly line, all other stops being done on the main floor conveyor. As the underbody is completed it is transferred onto a precision-built truck which serves as the building fixture on which the body remains until it is ready for delivery to Chevrolet across the enclosed railroad spur.

Immediately following the fitting of the underbody, comes the installation of the front end assembly, prepared at the side, and attaching it to the underbody. Then the balloon assembly, prepared at the side, is transported by an overhead conveyor to the assembly line and dropped onto the structure after the front section is secured in place.

Since the bodies are not individually framed in the usual assembly fixtures, Fisher uses a massive "gate" fixture which serves as a means of holding the entire structure accurately in alignment while the front end and balloon assembly are gas welded to the underbody, while at the same time assuring proper door opening and later door fit.

It is of interest at this point to comment on some of the production "tricks" developed by Fisher to facilitate the welding operations. In the first place, all welding points are so designed as to make them accessable to the welder from the outside. All welding tools are properly balanced and suspended to make for easy handling and reduce fatigue. In underbody welding on the assembly line, operations under the pan are done by torch welding from a pit while the body truck is moving over it.

The body moves along for detail spot-welding operations—welding of roof rails, back window frame, rear seat shelf, braces and reinforcements, inside details, etc., then through the enclosed and ventilated arc welding booth for the welding of structural members, floor pan parts, seat risers, etc.

Then follow the soldering operations and metal finishing. At the end of this stage, doors, which are fed on a monorail conveyor, are hung and the trunk lids attached. Bodies are given the final finishing touches in preparation for painting and ultimately are transported up a conveyorized ramp to the second floor paint shop.

Bonderizing, prime coat spray and bake, glazing coats and bake are followed by wet-sand deck operations and lacquer spray and baking. After the finish has been completed, repaired, and accepted, the bodies move into the trim shop for a lengthy series of operations—installation of glass, headlinings, trim panels, seats and cushions, garnish moldings, instrument panels, hardware, etc. As the body approaches the end of the line, it is polished all over, inspected and made ready for delivery to Chevrolet.

One of the most ingenious ideas in this department is the development of a special balanced fixture to facilitate the installation

(*Turn to page* 64, *please*)

A panoramic view of the body-in-white line, showing the turning of the conveyor as it moves from one section of the line to another. The suspended rails over the lines carry the power duct for the 360-cycle portable tools. Note too the excellent lighting from the overhead fluorescent light sources.

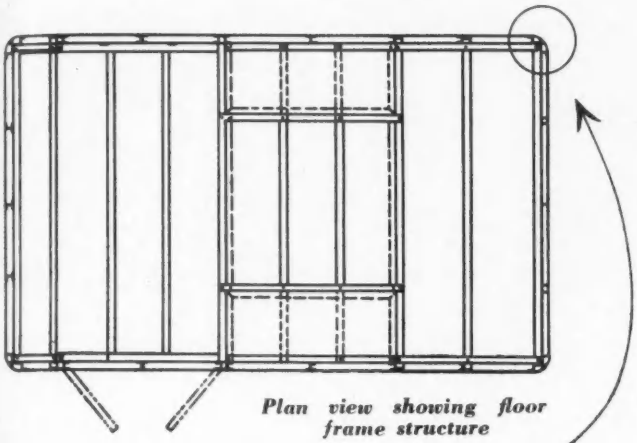
Prefabricated Shapes for

Magnesium Truck Bodies

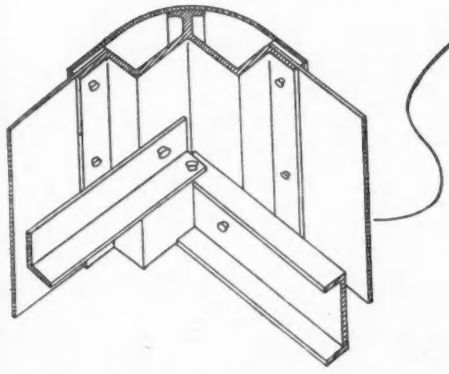
PREFABRICATED truck body parts of magnesium, ready for assembly, now permit truck operators to build their own magnesium truck bodies without previous experience in working with this material. These pre-designed structural members, offered by Revere Copper and Brass, Inc., eliminate all sheet metal forming by the builder and require only such processes as clamping, drilling and riveting.

The standard members of this group of prefabricated parts consist of extruded floor beams, corner posts, crown sill sections, side posts and roof carlines, structural angle section, roof corner castings, and sheet for all exterior panels. In many cases these shapes are supplied to exact length so that no additonal cutting is necessary. However, where trimming is required, it is slight; and the fabrication of the body then resolves itself into a function of assembling flat side and roof panels to the shapes with aluminum rivets.

The inter-section floor beam and corner post, shown on this page, is of interesting design. The inner post has a center protrusion which runs its entire length and which supports the outer shell at its most vulnerable point, thus eliminating the need for hand-fitted wooden reinforcing blocks. Because this post provides a smoothly rounded corner, the exterior panel can be fastened flat between the inner and outer members by rivets. The outer shell is about ⅛ in. thick or about four times the thickness of the conventional steel panel corner, thus providing adequate resistance to denting. This same principle of thick paneling is also applied to the roof rail extrusion to prevent roof shoulder damage.

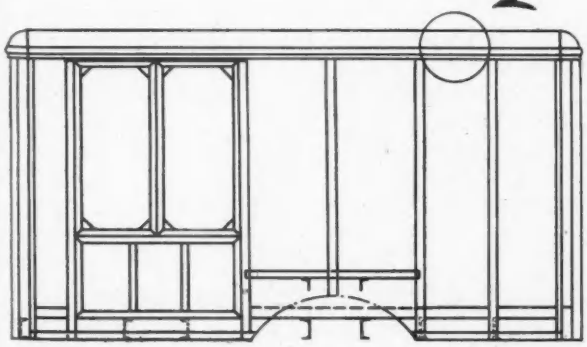


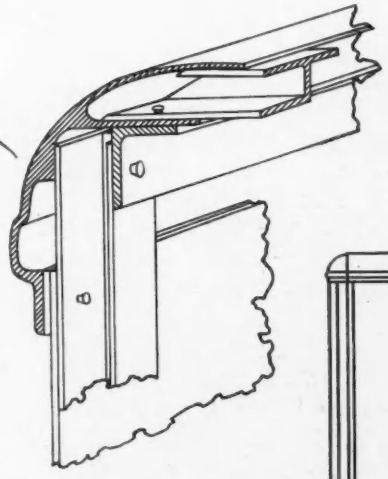
Plan view showing floor frame structure



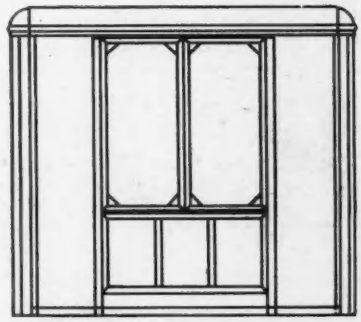
Details of floor beam and corner post assembly showing how side and end panels are riveted to the composite corner member

(Below) This side view shows frame structure of magnesium body. Measuring 139¼ in. long by 80¼ in. wide by 76 in. high, weighed 1060 lb. in magnesium, as contrasted to 2300 lb. in steel





Details of roof rail assembly, showing roof rail member, side post, roof carline, reinforcing angles and corner casting



Rear view of magnesium truck body structure

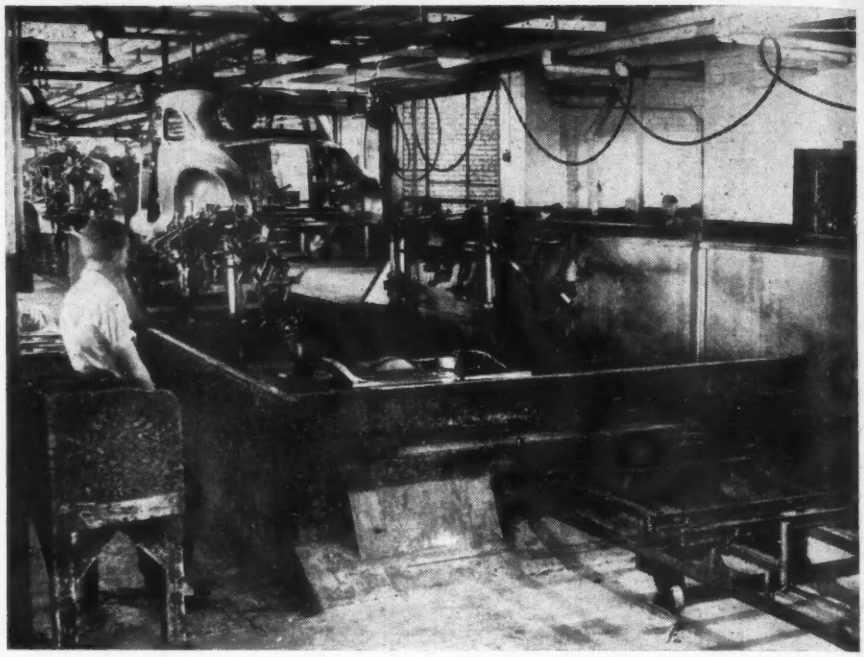


Fig. 1—This photograph shows the starting point where fixtures are loaded with under-body assemblies to begin their circuit on the Big Bertha conveyor line. The under-body assembly on the fixture in the foreground is descending to the floor below while the completed body in the background is ready for removal

Complete Car Bodies Built on Big Bertha Conveyor

Among Other Special Purpose Equipment at Briggs Plant Is Merry-Go-Round Setup to Expedite Assembly and Welding Operations on Floor Pans

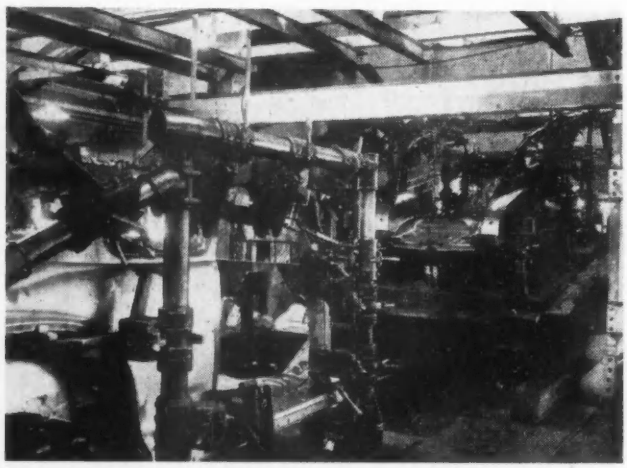


Fig. 2—Opposite end of the conveyor on the third floor. The partly framed body in the fixture at the right is moving up to the fourth floor

ALMOST unusual and effective application of conveyor lines, the huge conveyor system devised by Briggs production engineers for building steel passenger car bodies at the Briggs Mack Ave. plant in Detroit travels between two floors and transports 14 body framing jigs simultaneously past workers and sub-assembly conveyors. In one complete circuit of this conveyor system, dubbed the big Bertha, the entire body is built from the starting point where the under-body or steel floor pan is fitted onto an empty fixture to the position where the body, completely built and welded, is removed.

These photos show something of the massiveness of the Big Bertha, of which there are two in operation. Fig. 1 is the starting point on the fourth floor. A fixture containing the under-body assembly is shown moving down to the floor below. Behind it a completed body is removed from another fixture which then will be loaded with the under-body stock to begin the circuit.

On the third floor at the opposite end of the Big Bertha, a fixture with a partly framed body, Fig. 2, is shown moving up toward the fourth floor. Each fixture makes a trip around the Big Bertha approximately five times an hour. At stations alongside on both floors, workers fit the under-body,

side panel, dash and roof into each fixture and perform the necessary welding operations. This unusual conveyor is approximately 175 ft long.

Another of the many special-purpose conveyors at the Briggs plant is the "merry-go-round," so named because it transports jigs or fixtures in a circle past workers and stock, while various assembly and welding operations are performed. Briggs welding engineers developed three such merry-go-round conveyors to perform automatic welding on the steel floor pan for car bodies. Front and rear halves of the pan travel on separate conveyors while reinforcements and supports are welded. Then both halves are placed in fixtures on a third and larger merry-go-round which welds them together automatically. Welding guns are fired by hydraulic pressure, a Briggs engineering advancement over the former use of hand-operated welding machines. Fig. 3 shows one of the merry-go-round conveyors on which under-body panel stock is reinforced, then welded together into a subassembly by the automatic hydraulic welding machine which is shown in the background of the photograph.

Fig. 3—One of the merry-go-round conveyors, on which under-body panel stock is reinforced, then welded by the automatic hydraulic welding machine in the background

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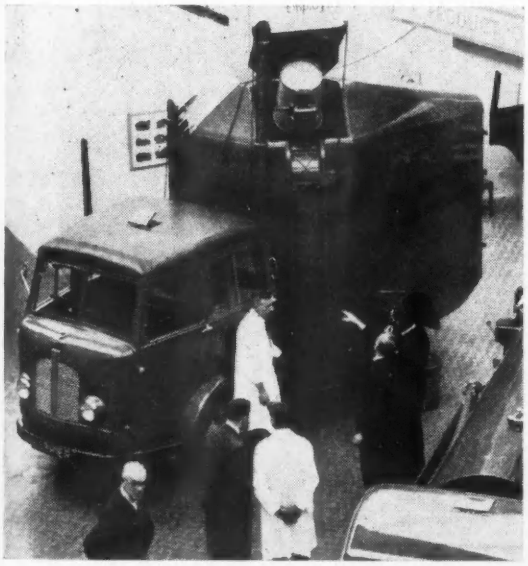
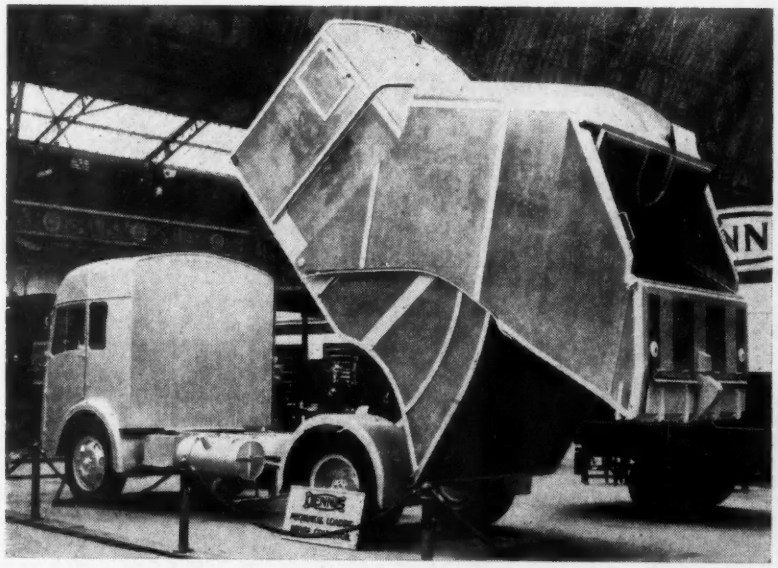
Mechanized Refuse Collectors

BRITISH manufacturers of motorized refuse collectors introduced some mechanical loading ideas in their equipment at the recent Public Works, Roads, and Transport Exhibition at the Olympia in London.



(Above) This Karrier Yorkshire model lifts mechanically a fully-loaded refuse bin, discharges its contents into the body, then lowers and detaches the bin from the vehicle.



(Right) Dennis Bros., Ltd., presented this collector. Refuse is deposited in the machine by half-round vertically-operated sliding covers, of which there are four on each side. The body is elevated to a 45 deg angle by means of a power-operated hydraulic mechanism. (British Combine photos)

Table 1.—Motor Vehicles in Circulation in Italy, 1938-43[1]

Year	Automobiles	Buses	Industrial Vehicles	Total
1938	345,098	9,960	112,566	467,624
1939	362,836	10,312	112,311	485,459
1940	353,499	8,707	110,492	472,698
1941	341,178	8,289	113,535	463,002
1942	336,809	8,155	112,304	457,268
1943	335,960	8,150	112,764	456,874

[1] Data for 1943 are incomplete.
Source: Associazione Nazionale fra Industrie Automobilistiche e Affini, Turin.

Current Activities of Italian Automobile Firms

Output Is Increasing with Emphasis Switched from Trucks to Passenger Cars, but Coal and Steel Shortages Continue to Hamstring Industry

By James Parker Wilson*, United States Embassy, Rome

ITALY has always been a country with a relatively low automobile density. A census of all vehicles in circulation in Italy in the years 1938-42 and until March 31, 1943 is shown in Table 1. With regard to current circulation of vehicles in Italy no complete government or industry data are available. Statistical investigations are underway to ascertain the present situation of automobile circulation in Italy. For the time being however, it is necessary to use figures taken from various sources which seem to conflict with one another.

A report of the Ministry of Transportation on the number of vehicles in circulation on June 1, 1946, shows 120,000 automobiles, 3200 buses, 82,000 trucks, 8500 trailers and 100,000 motor tricycles and motor cycles bringing the total to 313,700 vehicles. Such figures, even though issued by an offiial agency, must be acepted with reserve due to the present difficulties which confront the researcher and reporter in verifying statistics in this field and also because it is difficult to know what system was used in gathering the data. Figures collected by the United Nations Relief and Rehabilitation Administration as of February 1, 1946 show a total of 230,458 (not including trailers and motorcycles). This total includes 97,962 automobiles, 128,666 trucks and 3830 buses.

Industry circles indicate that a better picture of circulation is presented by Ente Nazionale Autotrasporti Coso, which organization was suppressed because of its political background and replaced by the Auto Transport Sales Office (Ente Autotrasporti Merci). Preliminary estimates on circulation as of June 1, 1946 as released by the latter organization, are shown in Table 2. As of January 1947, manufacturers estimated that vehicles in

Table 2.—Motor Vehicles in Circulation in Italy, June, 1946

Type of Vehicle	Weight in Metric Quintals	By Type	Total	Load (Capacity) Metric Quintals [1]
Automobiles	.....	.....	100,000	.....
Trucks	20	73,940	.....	667,223
Trucks	20 to 40	24,327	.....	763,000
Trucks	Over 40	13,609	.....	792,154
Total Trucks	.....	.....	111,876	2,222,377
Buses	.....	.....	3,500	.....
Vans	.....	.....	10,724	.....

[1] One metric quintal equals 220.46 pounds.
Sources: Ente Nazionale Autotrasporti Merci (formerly Ente Nazionale Autotrasporti Cose), Turin and Milan. A. N. F. I. A. A., Turin.

* This article is from a report by Mr. Wilson to the Office of International Trade, U. S. Dept. of Commerce.

circulation in Italy, because of the destruction caused by war and by the German occupation, had been reduced in number to a level of about 45 percent of the vehicles in circulation in 1939.

Table 3.—Production of Automobiles and Industrial Vehicles in Italy, 1938-46

Year	Passenger Automobiles	Industrial Vehicles	Total [1]
1938	59,000	11,777	70,777
1939	55,533	13,301	68,834
1940	22,252	25,604	47,856
1941	11,306	28,277	39,583
1942	9,071	20,544	29,615
1943	4,014	17,120	21,134
1944	1,818	11,963	13,781
1945	1,973	6,585	8,558
1946	10,989	17,994	28,983

[1] Includes all industrial vehicles including buses, but does not include military trucks and buses.
Sources: Ente Autotrasporti Merci, Turin, and Milan. A. N. F. I. A. A., Turin.

Production

Production of motor vehicles in Italy in the recent years preceding the war, during the war, and immediately following the war, is set forth in Table 3. Production immediately following the war was centered on industrial vehicles needed for reconstruction purposes. The trend now appears to be to greatly increase production of passenger cars. Output suffers from irregular and incomplete deliveries of supplies from abroad. Coal and steel are the chief shortages which hamper the further development of production. With regard to the production programs of the principal automobile manufacturers during the war, as well as at present, the following summary highlights the situation:

FIAT, LTD., Turin—Nearly all of the Fiat plants were first bombed in November and December 1942, later in July and August of 1943, and again in May of 1944. Fiat's production had been decentralized to the utmost and output fell to low levels during the period of the German occupation. Building activity was revived again after the Germans were expelled. At present Fiat is manufacturing trucks of the (626N) type (load 3½ metric tons); the 666N (load 7 tons) and buses for 30 passengers as well as automobiles having 30.5 cu in., 61 cu in. and 91.5 cu in. piston displacement. The Fiat company advertises a gasoline consumption of about 7 liters per 100 kilometers (about 40 miles a gallon) for the Tipo 500 (30.5 cu in.).

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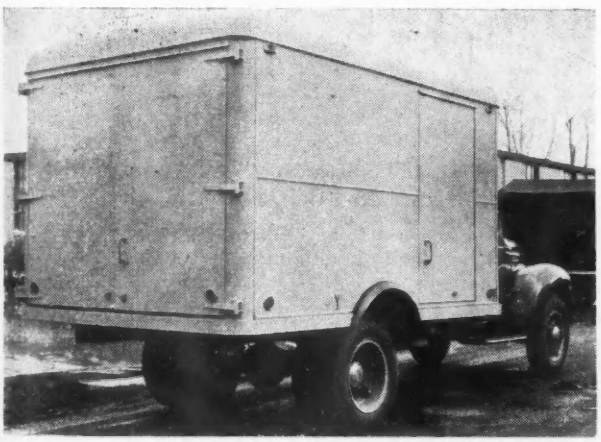
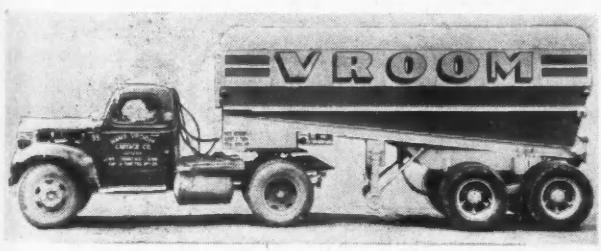
Gramm's New Truck Bodies . . . and Cement Trailer



One of Gramm's new prefabricated truck bodies



Gramm trailer for hauling cement and other granular materials

A LINE of Unisteel prefabricated van truck bodies available in sill-mounted or wheelhouse types and a new trailer specially designed for hauling cement or other light granular materials has been announced by the Gramm Trailer Corp., Delphos, Ohio. The interchangeable major sections and parts that make up a van truck body assembly are shipped knock-down and may be assembled in any local body shop.

The basic design principle of the cement trailer is that of aeration of the load, which is air suspended instead of being carried on friction surfaces. The trailer body consists of the main hopper, the load being distributed into two inclined wall hoppers widely separated at the front but tapering to the rear so as to meet a common discharge gate. At the bottom of each hopper is a removable and replaceable "cartridge" consisting of a steel box section member with a tightly stretched canvas fabric belt at the top. This belt provides the surface on which the load rests and from which it is discharged. A single cylinder, four-hp air-cooled gasoline engine, direct-connected to a Roots blower supplies air under two lb gage pressure through piping into each of the two cartridges while the vehicle is unloading.

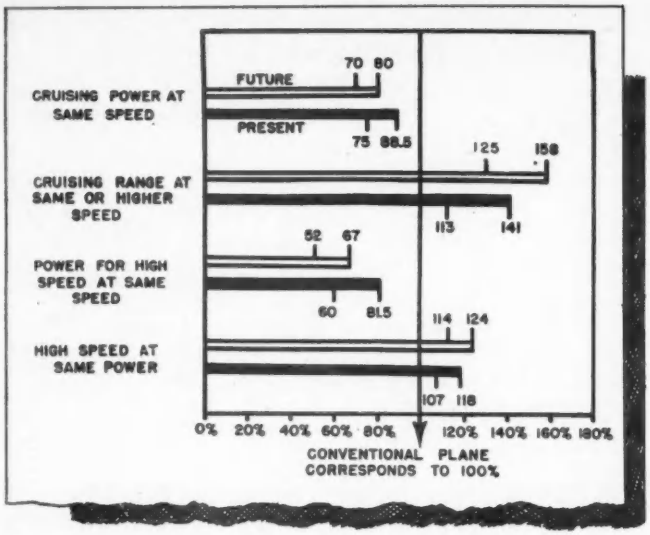
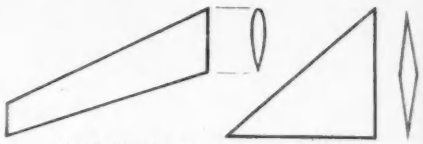


Fig. 1—Graph of performance characteristics of all-wing aircraft as compared to a performance of 100 per cent for conventional plane having same gross weight, same wing span, and maximum speed up to approximately 500 mph. Present performance of all-wing type is shown by lower line; and predicted performance of future all-wing craft is indicated by upper line.



TYPE	CONVENTIONAL	DELTA
THICKNESS AT ROOT	1	1
TAPER RATIO	2:1	∞
THICKNESS RATIO	15%	7½%
ASPECT RATIO	8	4.5
ROOT CHORD RATIO	1	2
SPAN RATIO	1	.75
VOLUME RATIO	1	.833

Fig. 2—Comparison of subsonic and supersonic wings of same thickness.

Northrop's Flying Wing
Can Out-Perform Conventional

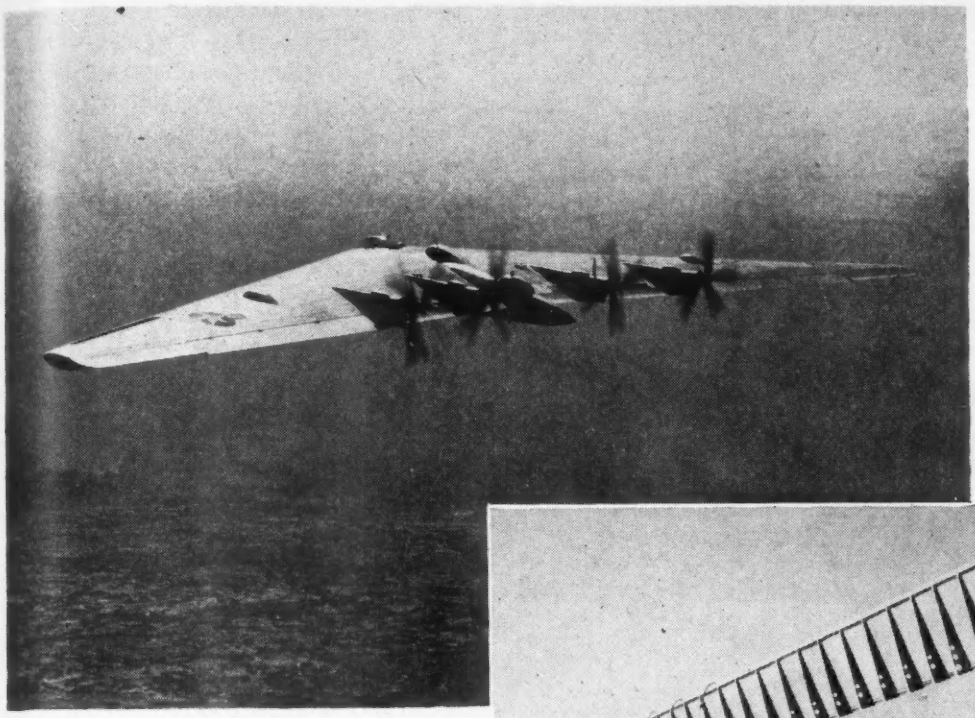
STARTLING gains in the aerodynamic and structural efficiency of an aircraft can be achieved with the all-wing design provided certain basic requirements can be fulfilled. First, the airplane must be large enough to allow full utilization of the all-wing principle. This is closely related to the density of the structural elements and the useful load to be carried within the wing. The second basic requirement is that the all-wing airplane must be designed to have sufficient stability and controllability for practical operation. This latter requirement has been demonstrated at Northrop Aircraft by hundreds of flights with different configurations of the all-wing type.

The extremes explored and satisfactorily flown in the Northrop series of all-wing craft range from a buzz bomb having a span of 29 ft, in which the warhead was cast as a portion of the airfoil, to the XB-35 long-range bomber with a 172-ft span. The buzz bomb was practical because of the comparatively high specific gravity of the warhead plus the fact that the configuration permitted almost all of the wing to be used as a fuel tank. The XB-35, however, is considerably larger than would be necessary to provide space for passenger, crew and pay load. This craft has a normal gross weight of 165,000 lb, an overload gross weight of 221,300 lb and sufficient volume within the wing envelope so that the maximum gross weight might well be increased to over 300,000 lb, over half of which could be devoted to bombs, fuel and miscellaneous payload.

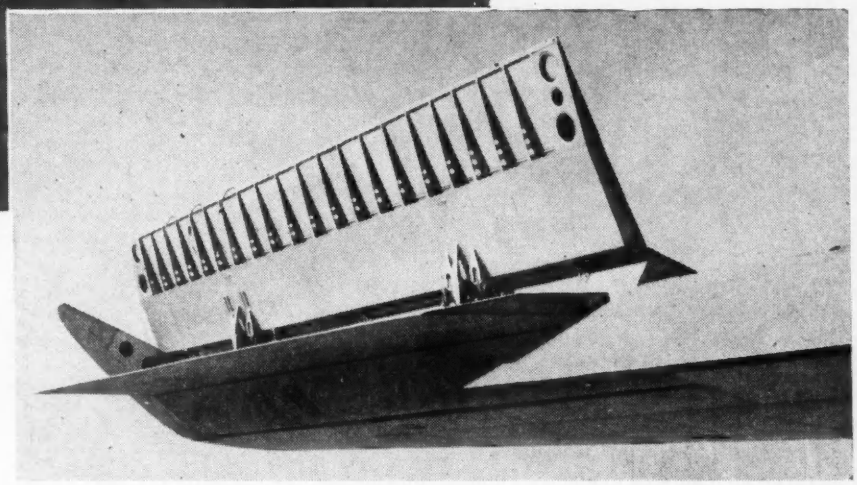
For use as a commercial transport, the XB-35's size and shape would be able to accommodate 50 passengers, a crew, and 40,000 to 50,000 lb of cargo at a density of 10 to 15 lb per cu. ft. This could be accomplished with less power than is required for a conventional plane with the same gross weight and cruising speed. Also, passenger vision would be more satisfactory since the all-wing arrangement would permit a view through the leading edge or downward through the floor.

All-Wing Performance

The maximum-range speed of an aircraft, based on the Brequet range formula for conventional recipro-



(Below)—Longitudinal and lateral control of the flying wing are combined in this wing-tip arrangement, the elevon. The split flaps operate together for pitch control and differentially for roll control.



(Above)—Northrop's 172-ft long-range bomber, shown here in flight, would be able to accommodate 50 passengers and 20 tons of cargo, if converted to a commercial transport.

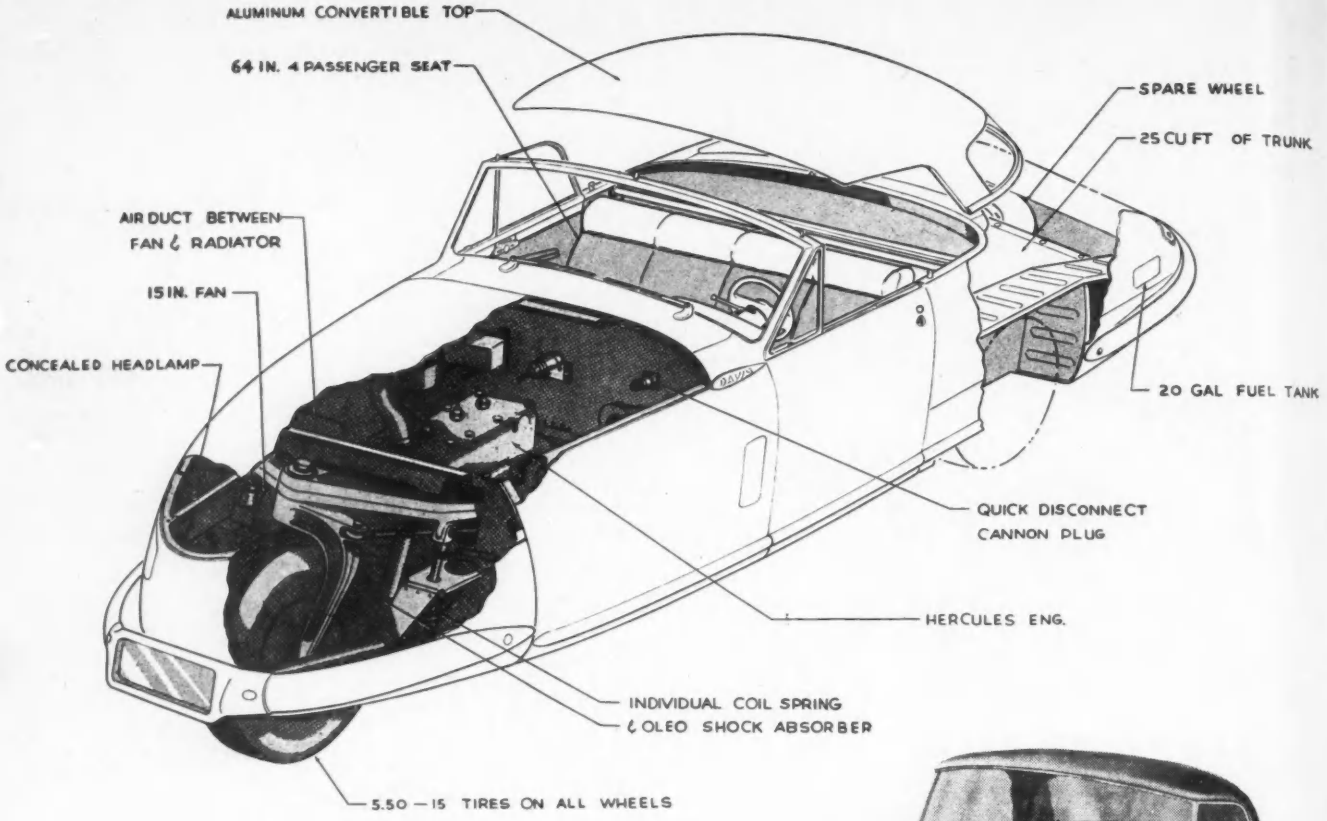
Aircraft

John K. Northrop, president of Northrop Aircraft, Inc., at a recent meeting of the Royal Aeronautical Society in London, presented these graphs and figures to prove that his all-wing design has superior flying characteristics over comparable aircraft of conventional configuration.

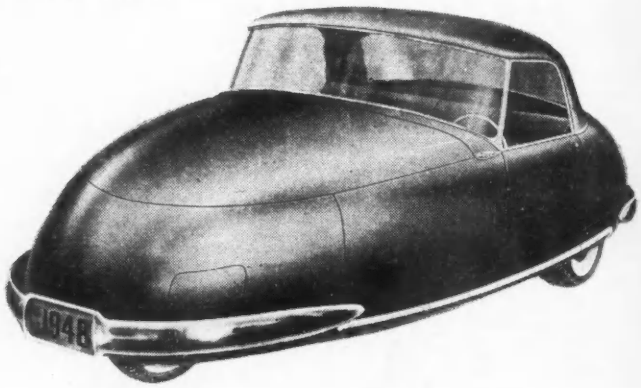
cating engines, is approximately that at which parasite drag and induced drag are equal. Since the total minimum parasite drag of an all-wing airplane is from 50 to 77 per cent that of a conventional craft, depending on whether flight conditions or landing conditions govern, the all-wing type will require from 25 to 11½ per cent less power than the conventional type at the same cruising speed, and with the same amount of fuel will fly from 33 to 13 per cent farther. If the all-wing airplane is operated at its most economical speed, instead of the most economical speed of the conventional airplane, it will fly 19 to 7 per cent faster, and the range will be from 41 to 14 per cent greater with the same amount of fuel. This is illustrated in Fig. 1.

Under high-speed conditions with any type of power plant, parasite drag becomes a much larger percentage of the total drag than for cruising conditions with reciprocating engines. At high speed the parasite drag may account for 80 per cent or more of the total, while the induced drag drops to 20 per cent or less. Using an assumed figure of 80 per cent parasite drag, the power required to drive the all-wing airplane at the same speed as the conventional airplane will be from 40 to 18½ per cent less; and the range at the high speed of the conventional airplane will be from 66 to 22 per cent greater. As turbo-jet and turbo-prop

(*Turn to page* 62, *please*)


ALUMINUM CONVERTIBLE TOP
64 IN. 4 PASSENGER SEAT
SPARE WHEEL
25 CU FT OF TRUNK
AIR DUCT BETWEEN FAN & RADIATOR
15 IN. FAN
CONCEALED HEADLAMP
20 GAL FUEL TANK
QUICK DISCONNECT CANNON PLUG
HERCULES ENG.
INDIVIDUAL COIL SPRING & OLEO SHOCK ABSORBER
5.50 — 15 TIRES ON ALL WHEELS

Cutaway view of Davis D-2 Car



Tooling Plans for Production of the Davis D-2 Car

By R. L. Bricker
Chief of Tool Engineering and Production Layout, Davis Motorcar Corp.

IN ALL tooling and production studies, the tool engineers of the Davis Motorcar Corp. have held three considerations as their prime goal. First, that the assembly methods be simplified to the ultimate; second, that all components be completely interchangeable; and third, that there should be a true fairing of all body contours and a proper evenness of fit between the various panels.

Simplified Assembly

The first consideration is, of course, a routine problem in any production layout, however, in this instance it becomes a matter of positive necessity. The Davis D-2 motor car was conceived as a full-sized automobile to sell for less than $1000. To accomplish this end in a product with luxury appointments meant that assembly must be reduced to the simplest of operations and that there could be no "built-in bottlenecks."

The tool engineering group began its planning in conjunction with the preliminary design layouts. The result has been a marked simplification of structure and a policy of not designing two or three parts where one could be made to serve. An excellent result of this advance planning is the demountable hard top. This feature was conceived as a solution to the problem of assembly convenience. Precedent would have called for welding the top shell to the body structure with attendant problems of grinding and smoothing, accessibility to interior installations and inconvenience in interior upholstery. Making the hard top instantly removable has permitted the assembly planner to layout all interior installations and inspections with com-

Davis D-2 Car Data

AT THE present time Davis engineers are having a production line set up in a former Timm Aircraft Corp. plant at Van Nuys, Calif., where 55,000 sq ft have been leased to build the D-2 car. According to company officials 10 pilot cars are being manufactured by subcontractors and are to be ready in about 60 days for display in key cities. The manufacturing schedule calls for 50 cars a day in about 90 days. Specifications of the D-2 car have been announced as follows:

Wheelbase	108 in.
Overall length	151 in.
Overall width	72 in.
Overall height	58 in.
Rear tread	60 in.
Seat width	64 in.
Weight	1328 lb
Ground clearance	8.0 in.
Shock absorbers	Hydraulic
Transmission	Standard
Turning radius	13 ft
Body	All aluminum
Frame	Steel tube
Top	Removable, hard top
Baggage compartment	25 cu ft
Brakes	Hydraulic
Windshield	72 in., curved
Jacks	Built-in, front and rear
Engine: Make	Hercules 4 cyl, L-head
Bore and stroke	3.25 in. by 4 in.
Piston displacement	133 cu in.
Max power	57 to 60 hp at 3300 rpm

plete accessability and to call for the top as an item of final installation. Also, the top itself has become the most simple of units. It is completed and upholstered in an inverted position and workmen on the job find the force of gravity an assistance rather than a curse.

The problem of interchangeability is tied in with that of fairing and fit. An elaborate system of tool masters, check gages and inspection fixtures was conceived to insure that sub-contractors and Davis made components alike would not be lacking in either consideration. The source of the Davis master program lies first in their lofted lines and second in their "attach point" master.

The contours of the Davis D-2 were derived through mathematical formulae in that the outlines are composed entirely of true mathematical conic sections. The contour lines were laid out full size on Fiberglas sheet (which has approximately the same reaction to temperature and humidity as the aluminum body skin) and were reproduced on metal through a photographic type process. Such printed metal plates, when lined up on a frame and filled with plaster, become a pattern for the lifting of forming dies. Similarly, they are utilized to set all assembly jigs and fixtures and to make inspection gages and etc. The basic body, running gear and engine attaching locations (to the chassis), are carried in a steel master jig. This unit was aligned by transit and the attach points were coordinated to the lofted lines. This unit is held as a "control master"; tool masters are set to it and in turn used to set assembly jigs and installation fixtures. This program of master tooling to locate attach holes and hold faired contours is carried on throughout the complete automobile, fabrication as well as assembly tooling being affected.

Fairing and Fit

Considerable attention and study has been given to the third basic consideration. Since the Davis D-2 represents an attempt to produce a truly clean, well contoured body, unencumbered with beads, reverse curves, chromium trim and the like; it must stand on smooth, true, flowing lines. The slightest irregularity

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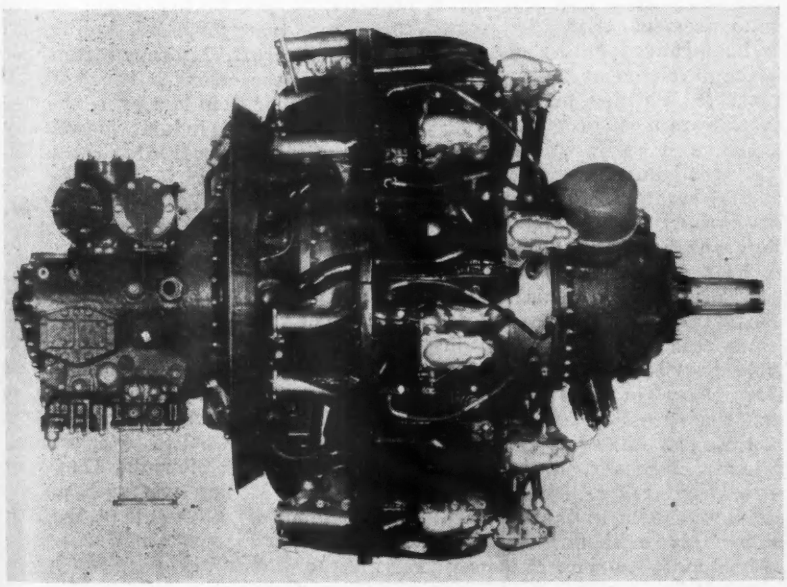
New Features of 1650 HP Twin Wasp



Pratt and Whitney's new 1650-hp, 14-cyl R-2180 Twin Wasp, shown here in a right side view, was designed for use in two-engined transports carrying about 30 passengers at speeds up to 250 mph. New features include a new type Bendix Stromberg updraft carburetor which incorporates an integral fuel pump and eliminates high-pressure fuel lines; split-type exhaust pipes equipped with flanges for attaching stacks or collectors; a high-speed power take-off on the rear case for driving a remotely-mounted accessory gear box; four pedestal-type vibration isolators, and a stainless steel engine diaphragm. A lightweight high-frequency Scintilla ignition system, which was provided as optional equipment on the R-2800 engine, is a standard installation on the new R-2180.

by Robert McLarren

JATO Grows

Expanding use of Jet Assisted Take Off procedures, together with increasing reliability of the rocket units, indicates an early acceptance of this operation as standard practice. It has been used successfully on tiny Ercoupe personal planes and giant Martin PBM flying boats. At the National Air Races, a Lockheed P-80A fighter, a Lockheed XP2V-1 patrol plane (the famed "Truculent Turtle," world's long-distance record-holder) and a commercial Beech twin-engine transport were taken off with JATO units in a graphic demonstration of its utility. Latest proof of JATO's usefulness is the installation of 18 units on the new Boeing XB-47 jet bomber, soon to fly at Seattle. These motors deliver 1000 lb of thrust for several seconds, nearly doubling the total thrust of the giant bomber. The units are mounted in special retractable fittings around the fuselage of the swept-wing bomber.

XS-1 Attempt

First Bell XS-1 rocket-powered research airplane has been turned over officially to the National Advisory Committee for Aeronautics, and the exhaustive transonic flight research program is now under way. NACA has named Howard Lilly, Cleveland Laboratory, and Herbert Hoover, Langley Laboratory, as research pilots for the XS-1 project. The Army Air Forces have assigned Capt. Charles Yaeger to their XS-1 and the belief persists that a record-breaking attempt will be forthcoming shortly. While NACA will establish basic research date on transonic aerodynamics, the AAF is concerned primarily with high speed performance, and henceforth the two programs will diverge considerably.

Guided Missile Costs

As another factual blast at overly-optimistic predictions of "Buck Rogers" weapons, the AAF has revealed that its current full-scale guided missile project will cost about $7,000,000 for one, with the cost scaled down to about $270,000 per unit on the basis of quantity production. This missile will have a range of 5000 miles and will require from 10 to 15 years for research, development, construction and test—and it will be expendable!

Speed Record

Those in the best position to know are confident the Douglas D-558 will attain 675-700 mph before it is obsoleted by later types now nearing completion. It is currently undergoing a power plant change from the G.E.-Allison TG-180 to the new TG-190, which is basically a TG-180 capable of operating at higher turbine inlet temperature. The TG-190 is capable of 5000 lb of static thrust and 6000 lb with water-alcohol injection. This 50 per cent increase in thrust assures the Navy of considerable added speed in its future attempts. Further flights will have to be made immediately, however, due to the rapid drop in mean daily temperature at Muroc Army Air Base in late September and early October. Later than this the temperature drops down to the 50-70 F mark with accompanying lowering of the speed of sound and consequent compressibility effects over the airplane at lowered airspeeds.

Compound Engine Exit

The announcement that the Army and Navy have cancelled all their compound engine development contracts, of which Pratt & Whitney and Wright Aeronautical were most prominent contractors, brings a swift and sudden end to this promising power plant before its actual creation. By gearing a turbosupercharger directly back into the engine crankshaft, the majority of the waste heat formerly lost could be regained for useful work. This results in fuel consumption as low as 0.35 in some designs and as low as 0.40 in others. The Services' reason for the cancellation was, of course, fund slashes and the necessity for economy in all but the most immediately applicable projects. However, contractors had reported extensive development difficulties, particularly in the problem of "matching" the exhaust flow, turbine speed and shaft gearing. It is safe to predict that this move means the end of this promising power plant since its successful development would require a multimillion dollar program.

Industry Future Focusing

The new fiscal year for the Services, unexpected strength in the transport, reciprocating engine and equipment fields, and extremely rapid research progress are combining into a resurgent although tempered optimism in the aircraft manufacturing industry. Expanded government appraisal of industry problems through two new policy boards, the Air Safety Board and a more realistic approach by various government agencies are indicative of better days ahead for the industry. Most recent move was a thorough-going AAF-Industry conference in Washington on the question of revised procurement procedures with the new, independent Air Forces agreeing to a greate degree than ever before on the necessity for two, three or 5-year procurement programs which alone would permit the industry intelligent planning. Ultimately, such programs would require a constitutional amendment since that document specifically prohibits the obligation of appropriated funds for military purposes for a period greater than two years. This limits, for example, the setting aside of money for an extensive development and procurement program of a heavy bomber, such as the Convair B-36, which will require about five years for completion, now scheduled for June 30, 1949. Informed estimates of a one billion dollar gross for the industry for 1947 have been proved accurate on the basis of the first six months of the year, reports of which indicate a gross business of better than six hundred million dollars, broken down into about 60 per cent military aircraft, 20 per cent aircraft engines, 15 per cent transports and five per cent personal aircraft. Military aircraft deliveries for the calendar year will run actually higher than last year, although still far short of industry's well-supported minimum goal of 3000 planes for essential security.

British Lightplanes

Three new British lightplanes made their first appearance recently at a four-day aircraft exhibition and flying display sponsored by the Society of British Aircraft Constructors. Two of these, the four-place Prestwick Pioneer and the three-place Newbury Eon, were designed for civilian use with an eye on a world market. The other, the Heston A. 2/45, is a twin-tail boom pusher for military use.

Modern Foundry Layout Gives Clean Working Conditions

REPRESENTATIVE of the foundry industry's efforts towards establishing more desirable working conditions, a new foundry recently placed in operation at the Freeport Works of Fairbanks, Morse and Co., Freeport, Ill., utilizes the latest in equipment, layout and mechanization to provide a clean and efficiently operated plant.

This foundry, a comparatively small operation with a pouring capacity of 20 tons per day, pours only one type of metal—an electric-furnace cast iron from machine shop chips and turnings, gates and sprues, exclusively. This scrap is collected in gondola cars, transferred mechanically to a large storage bin, then delivered to a Moore Lectromelt melting furnace at regular intervals from a hopper. The metal is poured from the spout of the furnace into conveyorized ladles, and then into flasks.

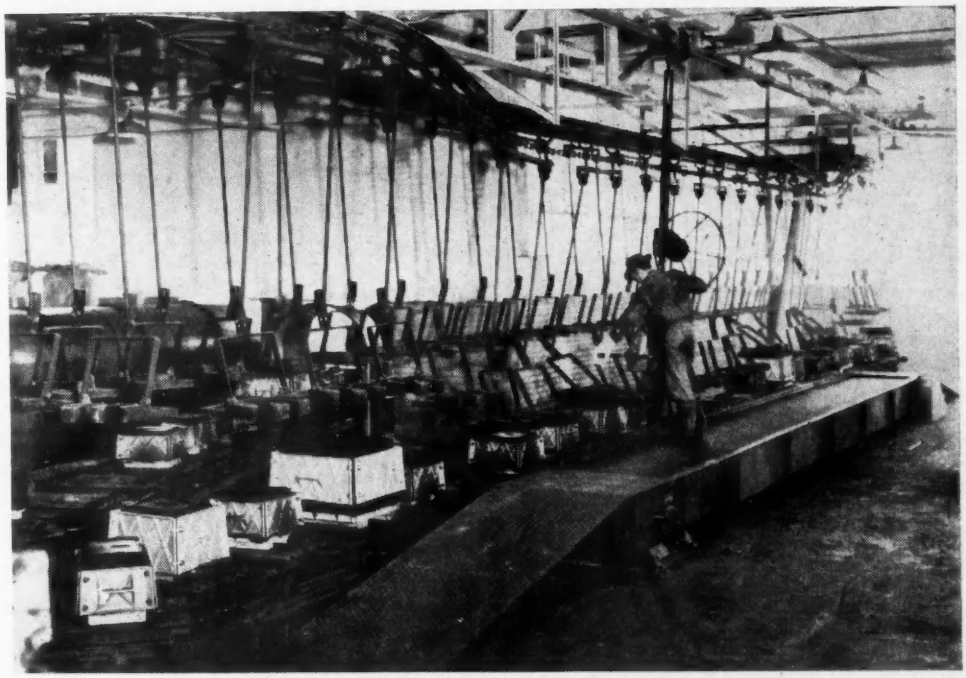


Fig. 1—Pouring line in the Freeport foundry, showing the pouring station at the right. The cooling tunnel may be seen at the left in the background.

A well-executed layout contributes largely to good housekeeping and a clean atmosphere. A single conveyor line, developed by Palmer-Bee, traverses the molding line, pouring station, cooling tunnel and shake-out. The cooling tunnel is fully enclosed and exhausted, thus eliminating fumes and dirt. Similarly the shake-out station, built directly at floor level, is hooded and keeps out the dust and dirt usually encountered at this point. The pouring station is well removed from the molding line, thereby insulating both areas from dirt and fumes. The sand handling system, also installed by Palmer-Gee, is designed to reclaim close to 100 per cent of all sand.

One of the interesting features of the pouring line, which has been used in other foundries operated by the company, is the weight shifter arrangement. As shown in Fig. 1, the weight shifters travel on the overhead conveyor and are timed to meet each flask on the pouring conveyor. The mechanism is designed to accommodate variations in flask size and height. Pouring is done through an opening in the weight shifter, serving as the main gate.

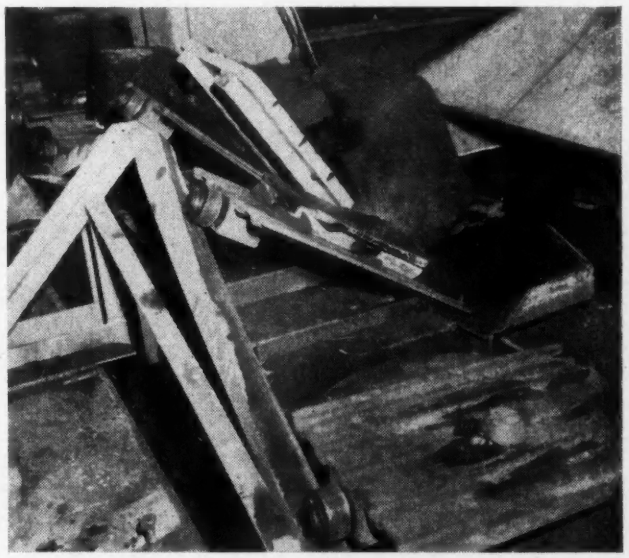
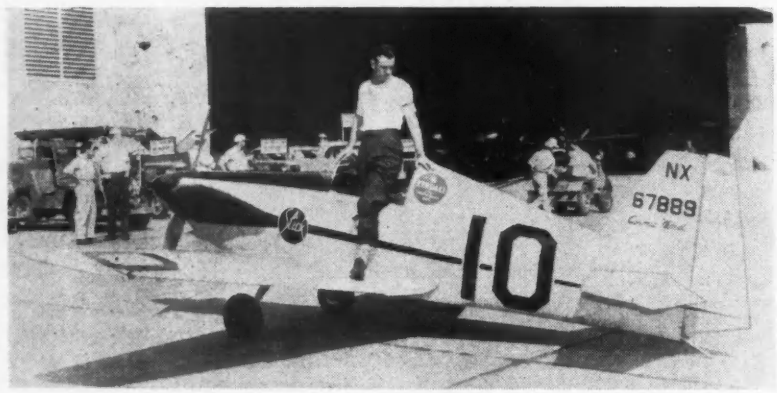


Fig. 2—This photo shows the knock-out and shake-out station in the conveyor line of the modern foundry at the Freeport Works of Fairbanks, Morse and Co. The outer rail of the conveyor is elevated to dump the mold onto the shake-out grate at the right. Note that this station, built directly at floor level, is provided with a fully-enclosed hood to eliminate dust and dirt.

Air Race Classic

Tests Water-Injection Engines and Sp

Goodyear Trophy Race Winners



These three planes took the first three places in the Goodyear race. (upper) Wittman mid-wing plane, rebuilt from the 100 kilometer speed record holder, captured first place. Its wing span is 16 ft. (middle) Only plane in the race with a V-type tail surface, this second place winner is owned by the Air Race Corp. of Los Angeles. Its span is 18.5 ft. (lower) LeVier low-wing all-metal entry which took third place. Wing span is 20 ft.

THE annual air race classic this year created new speed records, introduced original design, posed new problems and brought one death and several crashes, but continued to prove the National Air Races primarily a test of engines. Surplus military combat aircraft continued to dominate the races, but a new event, the Goodyear Trophy Race, returned originally-designed aircraft after an absence of seven years. Air Force and Navy participation was better than ever with both services using research and development as their central theme.

The pilots were younger but more experienced this year, and their ground crews were young men with the finest technical training in the world: years of service in the Army and Navy. It was not unusual for the pilot of a Lockheed P-38 to have had more than 2000 hours of flight time in the type with his ground crew having had an aggregate of 25 years' experience on the type. Many pilots flew combat aircraft they had flown in action during the war, and this experienced handling bore fruit when, at the conclusion of the races, there had not been a single mishap in the air between planes. In the trophy races, all of the crashes and mid-race withdrawals were due to engine failure, indicating the high degree of airmen competence displayed.

Engine Power Up

An entirely new plane in the National Air Races made its appearance this year, and all but swept the field: the Goodyear F2G-1 Navy fighter. This plane is a Chance Vought designed Corsair, of which the Goodyear Aircraft Corp. built 4100 during the war, designated FG-1. The Navy awarded Goodyear a contract late in 1944 for the design and construction of a Corsair fitted with a Pratt & Whitney R-4360 Wasp Major engine, the most powerful reciprocating engine in the world. Following

Goodyear Trophy Contest Introduces New and Original Designs in Light Planes

...d Special Fuel Blends

By Robert McLarren

successful completion of the Goodyear XF2G-1, the Navy contracted for a service test quantity of 10 of these powerful fighters. The first was delivered in June, 1945, and the last in February, 1946.

The end of the war cut short plans for quantity production of these planes, and the Navy subjected them to the standard acceptance flight tests and a brief period of service testing before declaring them surplus. Cook Cleland, 31-year-old former Navy fighter pilot, purchased three F2G's last July and Ronald G. Puckett, 28, also an ex-Navy fighter pilot, purchased one last spring. All four flew in the Thompson Trophy Race, two placing first and second, a third flying in fourth position in the race when it withdrew in the 19th lap, and the fourth crashing to destruction.

Although the wartime R-4360-4 engine is rated at 3000 hp at 2700 rpm for take-off, Cleland installed water injection equipment which permitted him to operate the engine at a manifold pressure of between 60 and 70 in. of mercury (compared to a maximum safe limit of about 50 in.) over a considerable period of time. This brought the Wasp Major output up to approximately 4000 hp, one-third over its rated power. For brief periods, Cleland has operated the engine at 100 in. of mercury at well over 3000 rpm producing an output in the neighborhood of 4500 hp by using water injection.

The Allison engines in the various races were all equipped with provisions for water injection. Although it was impossible to question all the entries, it is safe to say that at least 75 per cent of the Allison powered planes utilized water injection during the

1947 National Air Race Winners

Bendix Trophy Race "R" Division[A]

PLACE	PILOT	PLANE	ENGINE	AVERAGE SPEED
First	Mantz	Mustang	Packard V-1650	460.423
Second	DeBona	Mustang	Packard V-1650	458.203
Third	Lunken	Mustang	Packard V-1650	408.733
Fourth	Gimbel	Mustang	Packard V-1650	404.080
Fifth	Eddy	Mustang	Packard V-1650	376.549
Sixth	Mayson	Mustang	Packard V-1650	376.084
Seventh	Whitton	Corsair	P&W R-2800	320.025
Eighth	Lear, Jr.	Lightning	(2) Allison V-1710	292.680
Ninth	Page	Lightning	(2) Allison V-1710	247.812

Thompson Trophy Race "R" Division[B]

First	Cleland	Corsair	P&W R-4360	396.131
Second	Becker	Corsair	P&W R-4360	390.133
Third	Demming	Airacobra	Allison V-1710	389.837
Fourth	Beville	Mustang	Packard V-1650	360.840
Fifth	LeVier	Lightning	(2) Allison V-1710	357.488
Sixth	Bour	Kingcobra	Allison V-1710	327.280

Thompson Throphy Race "J" Division[C]

First	Lt. Col. Pettit	Lockheed P-80A	Allison J-33	500.704
Second	Lt. Howard	Lockheed P-80A	Allison J-33	497.943
Third	Lt. Col. Dunham	Lockheed P-80A	Allison J-33	494.656
Fourth	Capt. Gates	Lockheed P-80A	Allison J-33	484.878
Fifth	Lt. Col. Preston	Lockheed P-80A	Allison J-33	443.169
Sixth	Capt. Powers	Lockheed P-80A	Allison J-33	430.234

Goodyear Trophy Race[D]

First	Brennand	Wittman Special	Continental C-85	165.857
Second	Penrose	Chester Special	Continental C-85	165.393
Third	Salmon	LeVier Special	Continental C-85	158.798
Fourth	LeVier	LeVier Special	Continental C-85	157.851
Fifth	Siem	Loose Special	Continental C-85	151.270
Sixth	Robinson	Brown Modified	Continental C-85	143.865

Sohio Trophy Race[E]

First	LeVier	Lightning	(2) Allison V-1710	360.866
Second	Walling	Lightning	(2) Allison V-1710	351.785
Third	Hill	Lightning	(2) Allison V-1710	347.391
Fourth	Thompson	Lightning	(2) Allison V-1710	328.739
Fifth	Hlavacek	Lightning	(2) Allison V-1710	270.197

Tinnerman Trophy Race[F]

First	Knight	Kingcobra	Allison V-1710	352.168
Second	Tucker	Kingcobra	Allison V-1710	347.657
Third	Wittman	Kingcobra	Allison V-1710	339.467
Fourth	Whiteside	Kingcobra	Allison V-1710	313.513
Fifth	Bour	Kingcobra	Allison V-1710	254.913

Kendall Trophy Race[G]

First	Beville	Mustang	Packard V-1650	384.602
Second	Everson	Mustang	Allison V-1710	377.926
Third	Edmondson	Mustang	Allison V-1710	372.392
Fourth	Fairbrother	Mustang	Packard V-1650	367.035
Fifth	Murray	Mustang	Packard V-1650	357.084

A—Van Nuys, California to Cleveland, Ohio—2048.55 miles; for aircraft powered by reciprocating engines.
B—20 laps of 15-mile course; for aircraft powered by reciprocating engines.
C—12 laps of 15-mile course; for U. S. military jet aircraft.
D—25 laps of two-mile course; for requirements see text.
E—7 laps of 15-mile course; for Lockheed P-38 Lightning aircraft.
F—7 laps of 15-mile course; for Bell P-63 Kingcobra aircraft.
G—7 laps of 15-mile course; for North American P-51 Mustang aircraft.

Bendix race entries readying for take-off at Van Nuys field. (International News Photo).

races. The V-1710-81 used in the converted P-51A and A-36 Mustangs is rated at 1200 hp and water injection equipment permitted manifold pressures of 80-90 in. to be used, bringing engine output up to around 1800 hp. The later model Mustangs, which mounted Packard-built Rolls-Royce Merlin engines, rated at 1500 hp, produced as high as 2400 hp.

An outstanding installation was the Allison V-1710-135 mounted in the Bell P-39 Airacobra flown by Gerald Demming, Bell Aircraft test pilot, who took third place in the Thompson Trophy Race. This engine was designed for the larger, heavier Bell P-63 fighter, and its installation in the tiny Bell P-39 was a technical masterpiece. The engine is rated at 1425 hp, but Demming has obtained 2400 hp from it at 90 in. Hg using water injection. The P-39 is the same plane flown by Alvin "Tex" Johnson to first place in the 1946 Thompson race.

An infinite array of supercharger combinations was to be found, including one homemade adaption of the gear-driven blower from a higher-power engine on a lower-power engine. One installation was a two-stage blower borrowed from a late model Allison on an earlier model engine designed for a single-stage supercharger. The "high" blower was used throughout the race at sea level, but the engine failed short of the finish line.

One of the best kept secrets of the races was the matter of fuel blends. Persistent questioning, both of pilots and mechanics, failed to reveal the components of these mysterious blends with the exception of such mixtures as 100 octane and 130 octane, 100 octane and benzine and 130 octane plus various hydrocarbons, some of which produced highly questionable mixtures. Guarded references to liquid oxygen, hydrazine and even kerosene were made, but in general the various crews' attempts to hide their fuel formula from other contestants were completely successful.

Paul Mantz revealed the use of "weatherized" fuel in his Bendix-winning Mustang and inquiry by this author produced the fact that he had chilled the fuel before placing it in the tanks, thereby reducing altitude losses through "boiling off," at least in the early stage of his flight.

The toll of these various power-plant devices in engine life expectancy was obviously severe. At least two cases of main bearing failures and two cases of rod failures developed during the races, all four of which resulted in engine "explosions" in mid-air due to the high overspeed rpm of the engines at the time. On the other hand, the majority of engines held up well, and the Thompson Trophy Race in particular provided a measure of engine test time under extremely severe conditions although, of course, no quantitative data were obtained.

Least troublesome of all was engine lubrication—the aircraft oils held up well throughout the four days of rough flying, indicating the high quality of aircraft oil today. Light weight oils were used predominately of course, but at least one case of the use of SAE 40 and one case of SAE 60 was revealed, the latter being used on the theory that "high speed breakdown" of the oil would reduce it to normal viscosity. It was impossible to check the results of this theory after the race.

In general there was little if any mechanical modification of the high horsepower engines, such as milled heads, dome pistons, high-lift cams, etc. As military pilots and crews, the general opinion seemed to be a healthy respect for the design and manufacture of the engines and a desire to leave the operating elements "as is" rather than "improve" on these already high-compression engines. Again, main reliance for higher powers was placed in water injection and "special" fuel blends, in that order.

Aircraft Modifications

As with the engines, there was a minimum of structural modifications to the aircraft, other than the inevitable "wing clipping." Even this, however, appeared at a minimum, and the standard "full wing" military aircraft won most races and appeared in all the places. No P-51 Mustang wings were clipped, and only a question of a few inches were removed from several P-38 Lightnings to produce the fashionable "square tip" of the Mustang. However, rather extensive clipping took place on the Bell P-63 fighters, a total of 10 ft being removed from Steve Wittman's plane and 12 ft from that of Howard Lilly's plane, flown by Bill Bour to sixth place in the Thompson. This was technically justified, however, due to the fact that the P-63 is essentially a P-39 with five ft two in. added span and 35 sq ft additional wing area on an airplane with substantially the same stripped weight. By removing this extra area, the Tinnerman Trophy pilots believed that full advantage of the laminar flow airfoil and the higher-powered engine over the P-39 could be obtained.

Weight was thoroughly removed in the form of equipment which might remotely be termed military, and even small clips for flashlights and fairlead material used for chafing strips were removed. In strong contrast, however, was a reluctance to remove, lighten or redesign any of the structural parts of the airplane, again an indication of a healthy respect for the airplane manufacturer's design. Some canopies were

(*Turn to page 78, please*)

Higher Ceilings Authorized

for German Automobile Production

Special to AUTOMOTIVE INDUSTRIES

BERLIN—In revising the Four-Power Level-of-Industry and Reparations Agreement of March, 1946, the United States and Great Britain raised the automobile capacity of their zones in Western Germany to 221,500 motor vehicles, almost three times the first ceiling for 1947. Likewise, the announcement on Aug. 29 established considerably higher ceilings for the steel, chemical, light and heavy machinery, machine tool and other industries.

Germany's Motor Vehicle Production for 1946 and 1947 Ceilings

ZONE	Passenger Cars			Commercial Vehicles			Passenger Cars and Commercial Vehicles		
	1947 First Ceiling	New Ceiling	1946 Output	1947 First Ceiling	New Ceiling	1946 Output	1947 First Ceiling	New Ceiling	1946 Output
U. S.	20,000	98,800	0	17,000	29,000	3,670	37,000	127,800	3,670
British	20,000	61,200	10,685	21,000	32,500	2,984	41,000	93,700	13,669
French	0		—	2,000	2,000	521	2,000	2,000	521
Soviet	0	0	—	0	0	—	0	0	—
Total	40,000	160,000	10,685	40,000	63,500	7,175	80,000	223,500	17,860

The new passenger car ceiling is set at 160,000 units —98,800 for the American zone and 61,200 for the British zone. The commercial vehicle limit is placed at 61,500 vehicles, of which 43,500 are to be trucks ranging in capacity from one to five tons, 23,000 for the United States zone and 20,500 for the British zone. The other 18,000 commercial vehicles are three-wheeled motorcycle type. Six thousand of them are assigned to the United States zone and 12,000 to the British zone.

Efforts to revive the German automobile industry are being concentrated in four plants, all of which already are producing either passenger cars or trucks to some extent. The four plants are Opel at Russelsheim (Hesse), the Daimler-Benz plant at Stuttgart, both in the American zone; the Volkswagenwerke plant at Fallersleven, and the Ford plant at Cologne, both in the British zone.

Trucks are rolling off the assembly lines at all these plants except the Volkswagenwerke, which is devoted entirely to passenger car production. Car production is just getting under way at the Opel and Daimler-Benz plants, and is scheduled to start late this year at Ford's Cologne plant. The Hitler-conceived Volkswagenwerke is going full blast, however, having turned out 10,685 machines last year. The picture on 1946 German motor vehicle production, together with 1947 ceilings established by the Allied Control Authority and the new ceilings authorized on Aug. 30, is given in the accompanying table.

At the Opel plant the pilot model of the first passenger car to be produced in the U. S. zone since the war's end rolled off the line last February. This car, the four-cylinder, two-door light sedan known as the Olympia, is scheduled to go into production in October. Initially, it is to be produced at the rate of 15 a day, and later stepped up to 50 a day. Five hundred Olypmias are earmarked for export.

Recently reports have cropped up, however, that the Military Government may change its mind and order Opel to give production priority to a six-cylinder, four-door sedan known as the Kapitaen, which duplicates the Chevrolet to the extent that about 75 per cent of their parts are interchangeable. It is favored by the Military Government because it is heavier, and its production would require less tooling. Whatever the truth of these reports, the Olympia is certain eventually to receive emphasis, its design being especially planned for the European market as well as other areas with little gasoline and low purchasing power.

Daimler-Benz, which produces a heavier passenger car, turned out 11 units in June and expects to increase its output month-by-month, although no production schedule has been made public.

Hitler's widely-publicized Volkswagen is the only passenger car to be produced in Germany since the war's end. By now British Military Government requirements have been met to a degree where a limited number of these people's cars are available for purchase by authorized Americans in Germany. There are no present plans to sell these cars to Germans on the open market. Britain understandably would rather sell Volkswagens for dollars or pounds until the mark has established value.

The Control Authority's industry division reports that the Volkswagenwerke has been returned to full normal production; during April 1000 of these cars

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Current Activities of Italian Automobile Firms

(*Continued from page* 35)

LANCIA, LTD., Turin—The Lancia plants were bombed in November 1942, and the workshops at Turin were very seriously damaged. During the German occupation the Lancia company stopped making automobiles altogether and truck production was decentralized by the moving of the truck works to Bolzano where the output was on a reduced scale. At present Lancia is building cars of the Aprilia type (91.5 cu in.) and Ardea type (48.9 cu in.) and the company continues to produce trucks of the 3 RO type (load: 7 metric tons).

ALFA ROMEO, LTD., Milan—Alfa Romeo's workshops were also very heavily bombed, first in November 1942 and again in August 1943. Production was decentralized to the utmost but the damage inflicted upon the buildings at Milan was considerable. Alfa Romeo is now building trucks of the 430 type (load: 3½ metric tons) and of the 800 type, as well as a few sport cars of 152.5 cu in. Alfa Romeo also has resumed production of its special, well-known racing cars which have won laurels in numerous races in Italy and abroad.

EDOARDO BIANCHI, LTD., Milan—The workshops of Bianchi were almost completely destroyed during the heavy bombings of Milan in October 1942 and August 1943. The building of trucks, for example, was completely disrupted and no additional trucks were built until about the end of April 1945, when Bianchi started once again to manufacture trucks of the Civis type (load: 3½ metric tons). Automobile production had not as yet been resumed. The Bianchi workshops, which were almost entirely destroyed in the abovementioned bombings are now being rebuilt.

ISOTTA FRASCHINI, LTD., Milan—The plants of this company were heavily bombed in August 1943. The production of trucks, which was reduced to a very low figure during the German occcupation, gradually revived after the liberation. The principal types being produced at present are the D5 (load: 3½ metric tons) and the D80 (load: 7 tons).

O. M., LTD., Brescia—The workshops of this company at Brescia were not badly damaged during the war, even though they were bombed in February 1945. Present output is concentrated on the Taurus (load: 3½ metric tons) and the Orione trucks (load: 10 tons).

S.P.A., LTD., Turin—This company produced only military vehicles during the war and, notwithstanding the bombings during 1942, was able to resume production immediately after the liberation with its plants and equipment almost completely intact. Production was revived with the manufacture of trucks of the 38R type (load: 2½ metric tons) and the A-10,000 type (load: 10 tons).

MASERATI, LTD., Modena—With regard to racing cars, the plant at Maserati, Ltd., at Modena has resumed production of these specialized vehicles. Some of these machines, produced since the liberation, have already made their appearance at a number of the principal international racing shows in Italy and other parts of Europe.

Vehicle Exports

Exports of all types and kinds of Italian passenger and industrial vehicles totaled 20,000 in 1938, 25,000 in 1939, 13,659 in 1940, and 6662 in 1941. Estimates of exports in 1942, 1943, 1944, 1945 and 1946 are placed, respectively at 4168; 2202; 173; 19; and 785.

Taxes

For private passenger cars the annual taxes of the Republic of Italy, as of Jan. 1, 1947, are as follows:

Horsepower	Lire
5	1,530
6	1,740
7	1,990
8	2,260
9	2,570
10	2,900
11	3,270
12	3,660
13	4,090
14	4,540
15	5,030
16	5,540
17	6,090
18	6,660
19	7,270
20	7,900
21	8,570
22	9,260
23	9,990
24	10,740
25	11,530
26	12,340
27	13,190
28	14,060
29	14,970
30	15,900

For cars of greater horsepower, the tax corresponding to 30 hp will be applied with an increase of 950 lire for each unit of horsepower in excess of 30. The taxes listed above will be reduced by one-third on cars for hire by garages. There will be a reduction by a third for those used for public taxi services and by a fifth for those used for regular line services (buses).

For trucks, motor-carts and trailers, the single annual circulation tax will be levied according to the following schedule of rates: the vehicles with a useful load of up to 7 quintals: trucks and motor-carts—2250 lire, trailers—2490 lire; up to 8 quintals: 2700 lire and 2970 lire (the second figure always refers to trailers); up to 10 quintals: 4500 and 4950 lire; over 15 and up to 20 quintals: 9000 and 9900 lire; over 15 and up to 20 quintals: 13,950 and 15,360 lire; from over 20 to 25 quintals: 18,600 and 20,460 lire; from over 25 up to 30 quintals: 23,250 and 25,590 lire; from over 30 up to 35 quintals: 25,590 and 28,140 lire; from over 35 and up to 40 quintals: 27,000 and 30,690 lire; from over 40 and up to 45 quintals: 37,200 and 40,920 lire; from over 45 and up to 50 quintals: 41,850 and 46,050 lire; over 50 and up to 60 quintals: 48,000 and 52,800 lire; over 60 and up to 70 quintals: 57,600 and 63,360 lire; over 70 and up to 80 quintals: 62,400 to 68,640 lire; over 80 and up to 90 quintals: 72,000 to 79,200 lire. For over 90 quintals the tax for trucks is set at a fixed rate of 86,400 lire, that on trailers varies in rates, for over 90 and up to 100 quintals: 84,890 lire; over 100 and up to 110 quintals: 91,200 lire; and over 110 quintals 95,040 lire.

Labor

The reconversion of the Italian automotive industry from wartime to peacetime activity has created another obstacle of more of a social than an economic nature. That is the problem of dismissing part of the labor force, a problem which still awaits solution and is a very real threat to progressive financial rehabilitation of the companies.

General News

(*Continued from page* 23)

Lead

A quiet lead market, stable prices and no immediate expectation of a reduction in price in the near future typify the current lead situation. Inventory reduction on the part of consumers is seen as it becomes apparent that lead is becoming more available.

Zinc

Although the zinc market is generally easy, it is believed that established prices will remain firm in view of the veto of the subsidy bill, which resulted in closing down some high cost producers. The transfer to the permanent stockpile of the Metals Reserve zinc stockpile is another factor for believing that prices will stay at current levels.

Chevrolet Opens Campaign For Dealer Parts Sales

With the slogan "Bring It Back to Chevrolet — Parts-Service-Accessories," Chevrolet has opened a national campaign among dealers and their employees for an aggressive move to get car and truck owners and wholesale parts buyers to deal exclusively with Chevrolet dealers. The campaign is scheduled for the months of September and October in a concerted drive to increase the number of Chevrolet owners now doing business with their dealers. Inasmuch as Chevrolet has about 1.5 million unfilled orders for parts on the books, and adds about 30,000 orders a day, this campaign is designed more to boost the morale and customer relations of the organization, and to prepare for stiffer competition than it is to increase the dollar volume of business. According to Chevrolet there are about 6000 Chevrolet dealers, about 87,000 employees including dealers and mechanics, and a total of 334,000 wholesale parts customers. At the present time, sale of Chevrolet parts is running around $400 million, while accessories run about $125 million yearly. This represents over half billion dollars of service business. The labor bill alone is estimated at about $185 million as compared to $71 million before the war.

Ford Buys WAA Forging Plant

Ford Motor Co. is reported to have purchased a forging plant at Canton, O., from the WAA for $950,000. The plant was used by Republic Steel Corp. during the war. Ford will use the plant for producing forgings for its U. S. assembly plants.

Public Roads Estimates 37 Million '47 Registrations

Forecasting a 9.5 per cent increase in registrations of automobiles, buses, and trucks in 1947 as against 1946, the Public Roads Administration recently released a breakdown by states of estimated 1947 motor vehicle registrations as compared with those for 1946. A total of 37,-164,405 motor vehicle registrations for 1947—30,545,000 automobiles, 127,405 buses, 6,492,000 trucks—was estimated in contrast to 33,945,-817 registrations in 1946. A 7.8 per cent increase was estimated in 1947 reistrations as compared with 1941, which totaled 34,472,145. Publicly-owned vehicles have been excluded from the above comparisons.

SAE Men and Papers At SIA Meeting in Paris

The official representatives of the Society of Automotive Engineers at the 20th Anniversary Meeting in Paris, Oct. 10-12, of the Societé des Ingenieurs de l'Automobile are Henry L. Brownback, American engineering consultant; Maurice Olley, Vauxhall Motors, Ltd., Luton, Bedfordshire, England; and Stanley Menton, General Motors Overseas Operations Div., General Motors Corp., who is an alternate.

Among the papers to be presented at this meeting are "Why Not a European Type Light Car in the United States" by Henry L. Brownback; "Direct Fuel Injection for Spark Ignition Engines" by Frank C. Mock, Bendix Products Div., Bendix Aviation Corp.; "Diesel Engine of America" by Fred G. Shoemaker, Detroit Diesel Engine Div., General Motors Corp.; "Automobile Manufacturing Methods—Recent American Developments," Joseph Geschelin, Detroit Editor, AUTOMOTIVE INDUSTRIES.

Giant Climatic Hangar For AAF in Florida

An $8 million climatic hangar in Elgin Field, Fla., is now being used by the Army Air Forces. The hangar is reported to be the world's largest cold weather testing laboratory. Controlled weather conditions can be created for testing airplanes and equipment in cold, heat, rain, snow, wind, and sand. The dimensions of the giant hangar are 200 by 250 ft with a ceiling peak of 60 ft. Temperature variations from —70 F to 165 F and humidity control from 10 to 95 per cent at temperatures above 50 F are possible.

Henry Ford II to Speak At ASME Dinner, Dec. 3

Henry Ford II, president, Ford Motor Co. will be the speaker at the ASME annual dinner on the evening of December 3 in Atlantic City. The dinner will feature the 68th Annual Meeting of the Society, December 1-5, in Atlantic City.

SAE Manly Medal To Cearcy D. Miller

The 1946 Manly Memorial Medal will be awarded by the Society of Automotive Engineers to Cearcy D. Miller, research engineer of Battell Institute, Columbus, Ohio. The award, to be made on Oct. 3 at the SAE National Aircraft Meeting in Los Angeles, was for Mr. Manly's high-speed photographic research on engine combustion.

Northrop Has $22 Million Backlog

Northrop Aircraft, Inc., has about a $22 million backlog of military aircraft orders as of July 31. Included in this backlog are contracts under which Northrop is completing 15 Flying Wing B-35 and B-49 bombers.

Automobile Clubs Oppose Federal Licensing Law

Automobile clubs and other motoring service organizations are voicing vigorous protest to a proposed Federal law which would require that all persons operating motor vehicles on state or local roads or streets would be required to obtain an operator's permit from a Federal division of motor vehicles. The Automobile Club of Michigan states that it is in sympathy with the desirability of requiring every driver to pass suitable examinations in order to operate a motor car, but that licensing should be a state function. The club added further that cost of

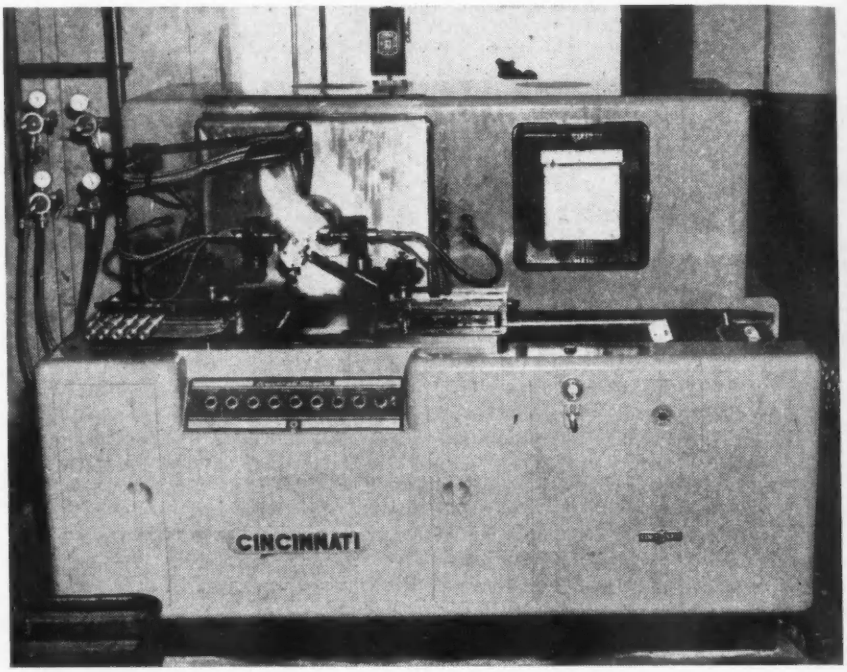
(*Turn to page* 86, *please*)

Electronically Controlled
Flame Hardening Machine

In discussing some of the new manufacturing methods recently introduced by the Rockford Clutch Division, Borg-Warner Corp., Rockford, Ill., A. A. Warner, president, has made special reference to an installation of the revolutionary Cincinnati Flamatic flame hardening machine built by the Cincinnati Milling Machine Co. This unit, possibly the first of its type, has been applied to the surface hardening of spline shafts and gears used in power take-off and reduction gear units. According to Mr. Warner this machine has proved to be a most practical method of handling a wide variety of parts that lend themselves to rotation.

A unique feature of the Flamatic hardening machine is the provision for sensitive electronic control of the temperature of the work, thus making it possible to specify the surface temperature required for a specific job. As illustrated, the Flamatic is a self-contained unit with the work station at a convenient height for the operator. Sole function of the operator is to load the part between centers or on an arbor, then press the starting button. The work immediately begins to revolve and the gas is ignited. As soon as the proper surface temperature is reached, the gas supply is shut off automatically, the work is released from the work station and drops into a quenching medium. A conveyor that runs through the quenching medium carries the part automatically to a discharge chute.

This machine will handle spur, bevel, and helical gears up to a maximum pitch diam of 8.0 in. with teeth ranging in size from 4 to 16 diametral pitch and even higher. The longest face accommodated by standard flame heads is two inches. Stem pinions require special consideration, but can also be handled up to 8.0 in. pitch diam. In general, the machine will accommodate parts with small diameters in lengths up to 18 in., and parts up to 8.0 in. diam with correspondingly small lengths.



Cincinnati Flamatic flame hardening machine with electronic temperature control.

German Production

(*Continued from page* 45)

were produced at Fallersleven.

Volkswagens seem likely to find a ready export market. Already representatives of Holland and Belgium firms have visited the Volkswagenwerke to discuss their sale outside Germany. Belgium, in particular, would like to import Volkswagens in a semi-finished state. The Volkswagen is priced for export sale at $640. The British have announced they plan to place funds from export sales of Volkswagens into a fund to purchase imports needed for the German economy.

Ford's Cologne plant, already producing trucks, is tooling up for passenger car production this fall, but the British have not announced any production goals.

The Control Authority's 40,000-unit ceiling originally set for passenger car production in 1947 represents 16 per cent of the 245,000 cars Germany produced in 1936 and considerable pressure was placed on the Military Governments to up this ceiling. The Automobile Industry Association of Hanover, for instance, estimates Germany's yearly motor car requirement at 250,000, including 50,000 for export as compared with the Control Authority's first 1947 quota of 40,000 entire production.

Truck production, which has reached 25 per cent of the first 40,000 yearly quota set for 1947, has been pushed energetically to provide vehicles for reconstruction work. Nonetheless, it has been beset by the same materials shortages likely to bottleneck passenger car production—shortages of steel, coal, rubber and asbestos for brake linings. For example, finished truck output for the last year has followed closely the curve of rubber supplies. When tire and tube production climbed last December and January, truck output showed a corresponding rise; and when rubber stocks fell in February, truck output followed suit.

German and Allied automotive experts believe, however, that they are on the way to breaking these supply bottlenecks. The British within the last fortnight have come up with rosy reports on the coal outlook, to which steel production is tied. Also British colonial rubber is arriving in ever-increasing quantities to ease the strain on Germany's war-wrecked Buna rubber industry.

German truck production further has been bottlenecked by the industry's prewar dependence on an almost fantastic number of sub-contractors. The Ford plant, for example, relied on 600 other plants to supply parts for its trucks. This figure has now been slashed to 250, and will be further reduced. Subcontracting plants in the Russian zone are being eliminated from the picture entirely because of zonal barriers.

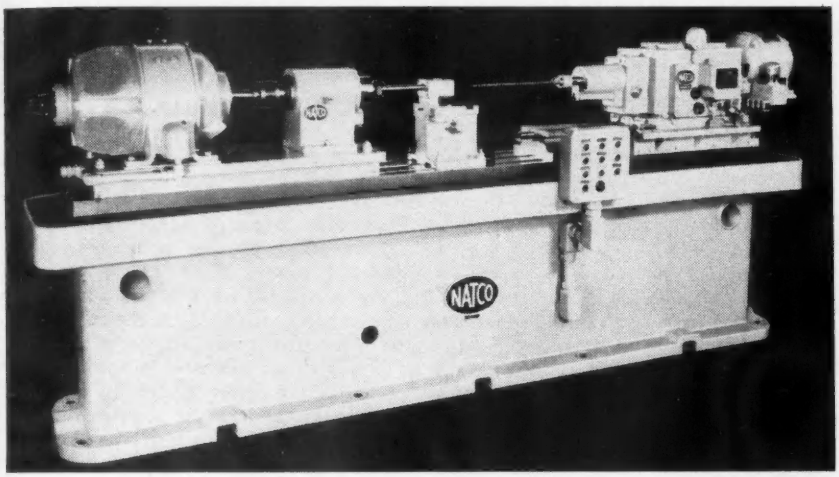
Opel, a General Motors subsidiary, is concentrating on a 1½-ton Blitz truck. Although current output is limited to 50 units a day by materials shortages, Opel hopes within three or four months to be turning out 1250 to 1500 trucks a month. Ford is turning out medium sized trucks and Daimler-Benz is making an Opel three-ton truck under Opel patents.

NEW
MACHINE TOOLS AND
PRODUCTION EQUIPMENT

For additional information regarding any of these items, please use coupon on page 60

E-155—Deep Hole Drilling Unit

The National Automatic Tool Co., Inc., Richmond, Ind. A horizontal deep hole driller, the Model E9HU, incorporating several unusual features. The machine is so constructed that standard two lip twist drills or single lip gun drills are used to excellent advantage.



NATCO E9HU horizontal deep hole driller

Deep oil passage and lightening holes not requiring accuracy of run-out or smooth finish are drilled with standard two lip twist drills at conventional speeds and feeds. Both the drill and the work are revolved, and a step feed cycle is used. In step drilling the chips are removed by frequent withdrawal of the drill. Size permitting, oil passage drills are used and lubricant at high pressure is supplied to the point.

Deep holes requiring smooth finish and minimum run-out are drilled with single lip gun drills at speeds higher and feeds lower than conventional for twist drills. In this case, only the work is revolved and a continuous feed is used. High pressure lubricant forced through the center of the drill provides lubrication at the cutting point and washes the chips back through the chip grooves.

Deep holes requiring a reaming operation are reamed with a standard reamer. Only the reamer is revolved and a continuous feed employed.

This deep hole driller is so arranged that the functions required for these methods can be readily obtained. That is, both the drill and the work can be revolved, only the work revolved, or only the drill revolved.

The right hand head is a standard NATCO E9 Holeunit equipped with a quick speed change gear driven drill spindle, and hydraulic feed arranged for either step drilling or continuous drilling cycles.

The left hand head is a work spindle head which is either locked stationary or revolved. When revolved, the spindle is driven by an electronically-controlled, variable-speed motor adjustable through a wide range of speeds. This combination is so flexible that the style of drilling, correct speeds and feed cycle required is readily selected.

E-156—Improved Surface Grinders

The Heald Machine Co., Worcester 6, Mass. A new line of surface grinders. In the new Heald surface grinders the wheel spindle is carried on a column, and the chuck table rests solidly on the ways of the base. All ways are well covered, overhang is small and constant, and wheel pressure cannot lift the ram.

The chuck is belt driven with no gears which might affect the finish and, as in all new Heald machines, the motor and pump are mounted off the machine where they will not transmit vibration or heat.

The vertical slide carrying the wheel is mounted in protected anti-friction bearings for rigidity and accurate feeding. The chuck has a variable speed drive, using a hydraulic motor. The table dogs are of the quick setting type, with micrometer adjustments.

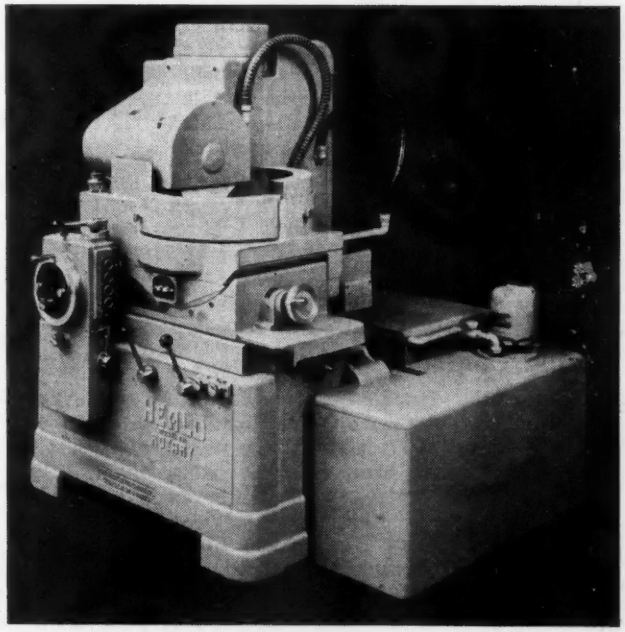
Power rapid traverse for wheelslide as well as table is provided, reducing effort.

The wheel spindle runs in automatically lubricated rocker shoe bearings, well known for their dependability, non-seizing qualities and ability to produce superior work finish.

These machines can be furnished with automatic grinding cycle.

E-157—All-Purpose Hand Truck

Automatic Transportation Co., 149 W. 87th St., Chicago 20, Ill. The Hyskid Transporter, an all-purpose hand truck for handling skid platforms with and without blocks. Featuring a vertical hydraulic lift which raises the platform a net lift of 13 in.—from six



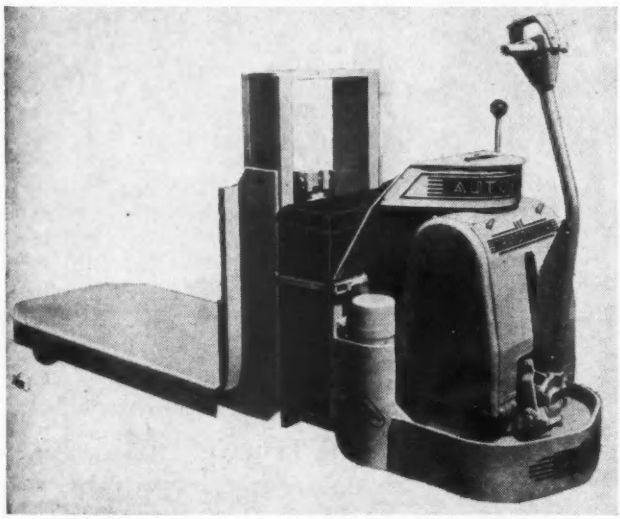
Heald surface grinder

NEW MACHINE TOOLS AND PRODUCTION EQUIPMENT

For additional information regarding any of these items, please use coupon on page 60

in. above the floor in low position to 19 in. in raised position—the new model Transporter is said to have the highest lift of any motorized hand truck built for horizontal handling. It will handle all skids, from the lowest to the highest used in industry—and still leave ample clearance to negotiate ramps.

The new Transporter is equipped



Hyskid Transporter

with the standard ATCO electric lift motor, which actuates a vertical hydraulic piston. It will raise a full-capacity load of 6000 lb at a rate of slightly more than one in. per second. It will raise the full 13 in. in 12 seconds loaded or 8 seconds empty. In actual use, however, the operator will adjust the platform height while traveling empty when handling skids of various heights, making it necessary to raise the platform only an inch or two when picking up a load.

The new model will be made in both 4000 lb and 6000-pound load capacities.

E-158—Electronic Sizing Control

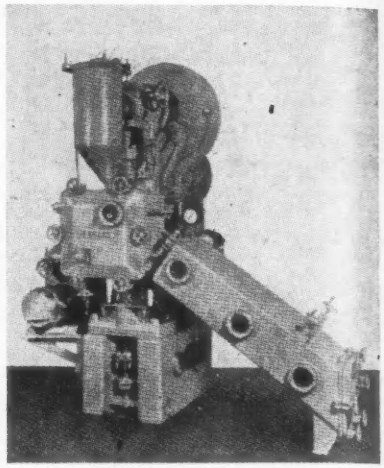
Micromatic Hone Corp., Detroit, Mich. Electronic control of automatic sizing. Electronic tubes are now used as the control, or brain, of the automatic Microsize device. When the bore is honed "to size" this sizing device takes over the control of the machine and directs it through the proper sequence of operations to end the cycle.

To insure this consistent performance, each operation of the mechanism must be rapid and positive, without variation, under high-production conditions. With electronic tubes this is possible because a tube fires much faster than a mechanical switch can operate. Also, since a tube has no moving parts, its operation is not impaired with use.

The electronic automatic sizing control (Microsize) on the Micromatic Microhoning machines contains two Thyratron electronic tubes. The trigger tube, picks up the "to size" impulse; the other, the timer tube, controls the runout period. Electronic Microsizing is said to make it possible to hold bore to bore size to .0003 in. or less in production. Combined with multiple spindle machines equipped with automatic rotary indexing fixtures, has made it possible to Michrone progressively. With this type of equipment, stock is removed in successive steps. The abrasive is varied to suit the condition of the bore at each spindle, and to produce the finish desired. As much as 0.008 to 0.012 in. stock per minute may be removed by these machines, from hard steel parts.

E-160—Press for Powdered Metals

The F. J. Stokes Machine Co., Philadelphia 20, Pa. A new machine and technique in which compressing of



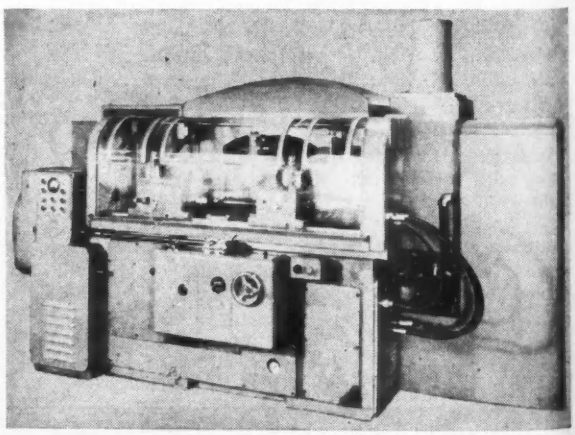
Stokes RV-4 press

metal powders, carbon mixes, sintered carbides, etc., is done under vacuum. This press applies a maximum of 20 tons pressure from above and below, has a die fill of 2⅝ in. and will produce pieces up to 3 in. diam.

Pressure from above is exerted by means of an adjustable eccentric crank and on the lower punch by cam action. A vacuum chamber surrounds the die table, the punches and the feeding device. The feed hopper, with vacuum cover, is attached to the top of the vacuum chamber and a receptacle under vacuum receives the finished parts at the side of the main vacuum chamber. Special stuffing boxes seal the upper and lower plungers where they enter the chamber.

In other respects this new RV-4 press is similar to the Stokes R-4, utilizing standard punches and dies, which are removable through the door of the vacuum chamber, and other standard equipment and movements.

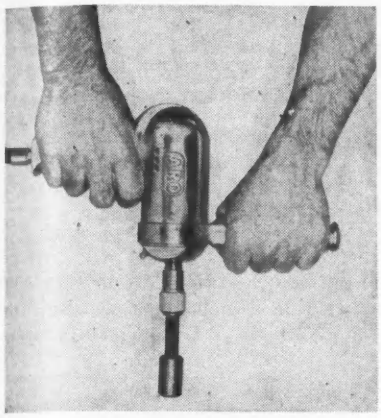
E-159—Thread and Form Grinding Machine



Jones & Lamson Machine Co., Springfield, Vt. A new 6 x 30 automatic multi-rib thread and form grinding machine. This machine is arranged for both crushed and diamond wheel dressing. It is designed for rapid production of multi-rib threads and form ground parts by the application of electrical and hydraulic controls to an improved mechanical design. It will grind single rib or multi-rib, one or two way, right or left hand, single or multiple starts, straight or taper. All electrical controls totally enclosed in floor mounted housing, according to machine tool electrical standards.

E-161—Heavy Duty Nut Setter

The Aro Equipment Corp., Bryan, Ohio. A new air-powered heavy duty nut setter, Model 7040, designed to handle large lag and wood screws.



Model 7040 nut setter

This tool is equipped with a side handle and a 7/16-in. hex ball lock adapter threaded directly to the spindle of the tool. The desired torque is obtained by regulating the speed through the regulator located on the side of the throttle handle.

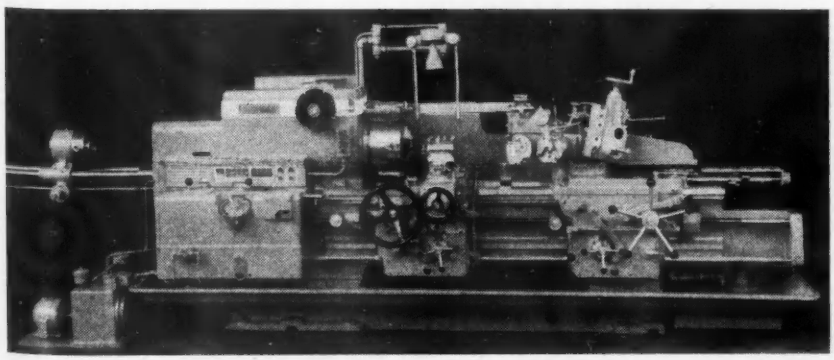
The tool is said to be especially efficient for drawing up nuts where pulling torque is required. This type of work is found in crating departments, wood pattern shops and numerous assembly shops.

Overall length of the tool is 8½ in. Weight, 6 lb. Speed is adjustable from 500 to 1000 rpm. It has an auxiliary handle that is adjustable to any position in 360 deg radius, and can be locked at any point.

E-162—Saddle-Type Turret Lathes

Gisholt Machine Co., Madison, Wis. New line of saddle-type turret lathes. These machines feature accessibility of adjustments for clutches, main driver motor and V-belt, spindle brake, turret clamp rings, motors, pumps, filters and other units. Operational ease is obtained with a hydraulic spindle speed selector and single dial feed change controls provided for both aprons.

The lathes can be equipped with a hollow hydraulic cylinder, actuated by a hydraulic clamp unit, for machining such parts as locomotive frame bolts, link pins and bushings. Because the spindle bore is open, the machine so equipped can be used equally well for bar or chucking work without any alteration of the chucking devices. This is said to contribute to fast change-over from one type of work to another.



Gisholt 1L saddle type turret lathe.

NEW MACHINE TOOLS AND PRODUCTION EQUIPMENT

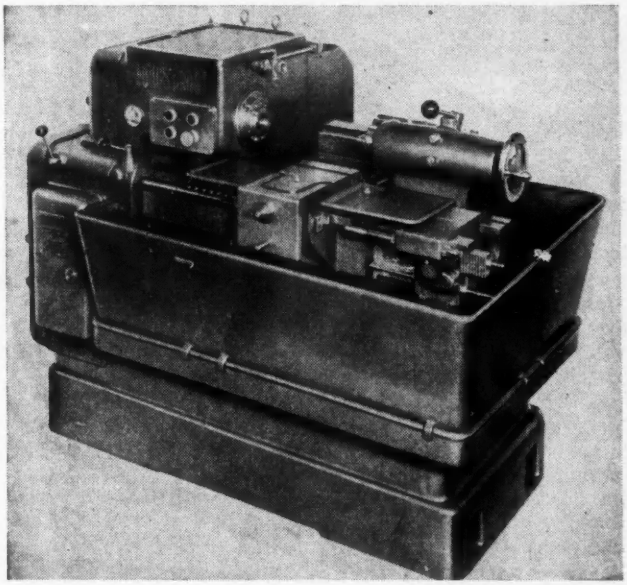
For additional information regarding any of these items, please use coupon on page 60

E-163—Small Model Automatic Lathe

Sunstrand Machine Tool Co., Rockford, Ill. A new and smaller machine, the Model 4, added to the company's automatic lathe line. This machine like all Sundstrand automatic lathes, provides the opportunity to use multiple tooling and automatic cycling on short run as well as long run work. This is possible because of the easy means of changing the machine cycle. Changing position of dogs on a cycle control disk changes the length of rapid approach, feed and rapid return stroke —enables the operator to set up cycles quickly and change over from one job to another easily.

Another feature of this machine is the speed and feed range for an unusually wide range of work. Spindle speeds are in a 60 to 1 ratio, and front carriage feeds range from .0015 to 0.054 in. per revolution. This provides the opportunity to use proper feeds and speeds for many different materials, cutting tools, and work pieces.

Screw feed to the front carriage is said to provide fine finish and long tool life. Automatic lubrication for all moving parts and hardened and ground carriage ways and slides are other features of his new machine.



Sundstrand Model 4 automatic lathe

The machine is designed primarily for fast, automatic multiple tool cycles on small work. Maximum swing over front and rear slide is 9½ in. in diameter. Maximum work capacity of the machine is five hp.

E-164—Automatic Metal-Cutting Saw

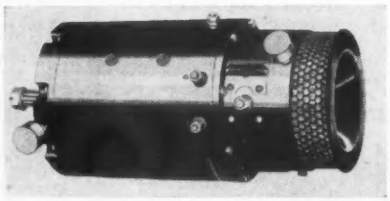
Wells Manufacturing Corp., Three Rivers, Mich. No. 12 heavy-duty metal-cutting band saw designed for cutting off rectangular stock up to 12 in. deep by 16 in. wide or cylindrical stock up to 12¾ in. diameter. In addition to cutting through stock, the saw can be automatically controlled to cut to any desired depth for work on dies or other parts. Also it features an automatic cutting cycle in which the blade is fed into the work at a constant pressure and the cutting head is returned by hydraulic power to its starting position above the work upon completion of the cut.

NEW Products

For additional information regarding any of these items, please use coupon on page 60

F-84—Heavy Duty Generator

Delco-Remy Div. General Motors Corp., Anderson, Ind. A new type of generator and regulator to meet the demand of present-day motor coach operation. Both the generator and the regulator are built to conform to proved standards of construction for heavy-duty service. The Model 1117567



Model 1117567 Delco-Remy generator

generator is typical of the new type. It is a heavy-duty, four-brush, four-pole shunt type generator designed to use a ventilating fan and an air cleaner through which the cooling air is drawn before contacting the internal moving parts. The armature is supported on heavy-duty ball bearings in both the drive and commutator ends. Brush holders are of the box type trailing and are assembled to a brush plate in the commutator end frame. The brush plate has slotted holes to permit adjustment of the brushes with respect to the neutral point.

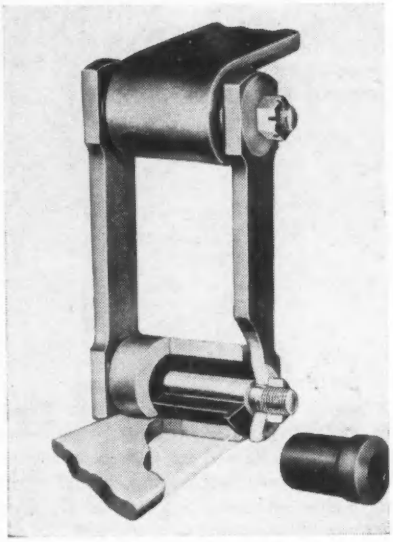
The high output at low speeds of which these units are capable is made possible through the novel application of well-established electrical engineering principles. In the new generator the four field coils are divided into two separate circuits of two coils each—hence the term, "split-field." By this construction, the magnetic strength of the fields is increased sufficiently to permit the hot generator to cut in at speeds as low as 560 rpm and to reach an output of 70 amperes at only 700 rpm. Above 850 rpm the generator is capable of a continuous controlled output of 120 amp at 13 volts.

A special regulator (Model 1118531) is required with the split-field generator, since current and voltage control must be maintained over each circuit separately, while at the same time the two voltage controls must be kept in balance with each other. This is accomplished in one generator regulator box by twin sets of current and voltage regulators accompanied by a special equalizing circuit. The equalizing circuit makes it possible to balance the two voltage regulators perfectly so that uniform control is obtained at both high and low speeds. A rheostat mounted in the wall of the regulator box makes it possible to adjust the system voltage without removing the cover.

The manufacturer states that it has been found that motor coach batteries are kept near full charge in installations using the split-field generator and its companion regulator. This reduces the cycling action on the batteries and thereby lengthens battery life. Also, the voltage of the coach electrical system is subject to less variation.

F-85—Long Life Spring Shackles

The Harris Products Co., 5105 Cowan Ave., Cleveland 4, Ohio. A new and improved spring shackle.—The new Harris "Concentrated Pressure" spring shackle is said to show an increase of



Harris spring shackle

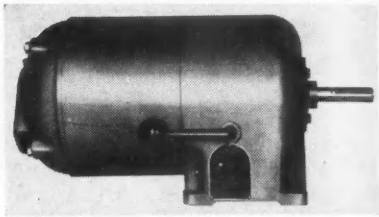
four to six times the normal spring shackle life. This new CP shackle is interchangeable with the previous type Harris shackle in general use prior to the war.

In the Harris shackle, the degree of angle through which it can turn without slipping and the load it can carry, are determined by the relationship of coefficient of friction, area of contact between rubber and metal, and by effective pressure applied to the rubber bushing. Since any increase in the area of contact would also mean increased size and cost, concentrated effort was placed on a means for effectively increasing pressure—also without increasing cost. This has now been accomplished by molding the rubber bushing with a radius rather than a straight shoulder, with correspondingly redesigned side plates for effectively concentrating the compressive force directly into the spring eye.

The manufacturer states that this concentrated pressure feature not only greatly increases the life of the Harris spring shackle on passenger cars, but with the higher unit loadings made possible by increased pressure within the spring eye, makes it applicable to commercial vehicles without the prohibitive number of eye sizes previously necessary.

F-86—Four-Speed Gearshift Drive

The Lima Electric Motor Co., 5301 Findlay Rd., Lima, Ohio. A new four-speed Type R, Lima gearshift drive,



Type R Lima gearshift drive with integrally-mounted motor

with integrally-mounted single phase motor.

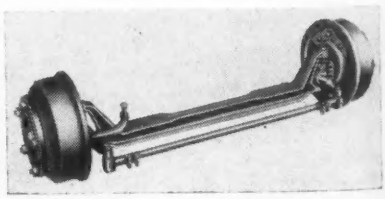
The new Type R units are built to drive machinery requiring selective speeds and are available in sizes of ½ hp at 1200 rpm and ¾ hp at 1800 rpm. Gear ratios of the Type R are 1 to 1, 1.33 to 1, 2 to 1 and 4 to 1.

The new single phase units will operate on 115 and 230 volts ac, 50 and 60 cycle. Mechanically the single phase and polyphase units are identical.

F-87—Fisk Air Borne Automobile Tire

Fisk Tire Co., New York 20, N. Y.—The Fisk Air Borne automobile tire. The tire has 300 cu in. more air volume but uses less air pressure than regular

F-88—Heavy Duty Front Axles for Trucks



Shuler Axle Co., Inc., Louisville 8, Ky. Heavy duty front axles for increasing the load-carrying capacity of Ford and Chevrolet trucks. Hubs are five in., stud, eight in. B. C. wheel mounting. Inner and outer bearings are Timken. Brakes, when supplied, are Wagner hydraulic 16¼ in. by 2¼ in.

Eliminate "Dead Weight" on Your Mobile Equipment with INLAND HI-STEEL

WITH INLAND HI-STEEL, you can get nearly twice the yield strength of ordinary structural steel. On mobile equipment this makes it possible to eliminate considerable dead weight without sacrificing strength. Hence operation is speeded up, braking loads are reduced, and payloads are substantially increased.

Hi-Steel has other advantages, too. It has about five times the atmospheric corrosion resistance of ordinary structural steel, and is far more resistant to abrasion. It can be worked hot or cold, with little or no deviation from standard shop practice, and can be welded by conventional methods. Hi-Steel is rolled in structural sections, bars, plates, strip, and sheets. Write for Engineering Bulletin No. 11.

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tires. In adidtion to its larger air chamber, the Fisk Air Borne tire has high streamlined shoulders which eliminate "non-working rubber."

Tests by company engineers are said to show that the tire runs 15 per cent cooler because of this construction.

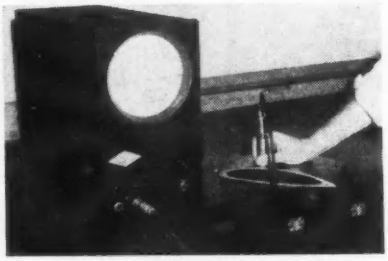
The tire features a flat, level tread that places more rubber on the road to give longer wear and quicker brake response. The contact area with the road pavement is longer and narrow, providing easy steering and parking controllability.

F-89—Thickness Measuring Instrument

Sperry Products, Inc., Hoboken, N. J. The Reflectogage—an instrument utilizing supersonics for thickness measurement and flaw detection that will supplement the Supersonic Reflectoscope and the Thruray already manufactured by Sperry Products, Inc. With the new instrument thickness of metals and other materials can be measured where access from only one side is available. Maximum error in measurement is said to be less than 2 per cent of the thickness of the material.

Thickness of tubing and flat parts, between 0.005 and 0.300 in., can be read directly from the face of the oscilloscope screen. Indirect reading of the thickness of parts up to 4 in. can be accomplished with slight calculation.

A quartz crystal searching unit is applied to the oiled surface of the material and the oscilloscope pattern observed by the operator. A vertical deflection of the oscilloscope trace will indicate resonance of the sound beam within the material. The position of the vertical deflection along the horizontal axis is

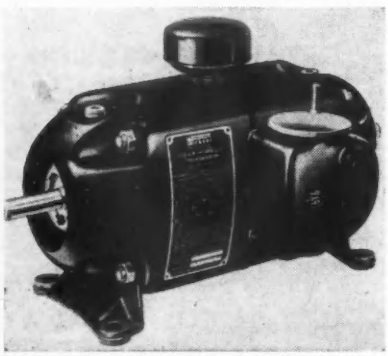


The Reflectogage

determined by the resonant frequency and is thus related to thickness. When thin pieces are being tested, this thickness is read directly from the superimposed calibrated screen. A different screen is used for each type of material and for each of four thickness ranges.

The Reflectogage is adaptable for the production line testing of thin pieces, or bonded or clad material, for internal defects or separations.

F-90—Variable Speed Hydraulic Transmission



Vickers, Inc., 1400 Oakman Blvd., Detroit 32, Mich. A variable-speed hydraulic transmission for fractional hp machinery drives. The output speed of this unit is adjustable and stepless from 0 to maximum rpm in either direction of rotation, with constant torque power characteristics throughout the entire speed range.

F-91—Super Cushion Automobile Tires

Goodyear Tire and Rubber Co., Akron, Ohio. A new line of automobile tires. The new tires, named "Super Cushion," are larger and designed for use on wider base rims than those in common current usage. The tires require 14 per cent less air pressure (from four to six lb less per tire, depending upon the car which they equip), are relatively lighter in comparison to their size than conventional tires, and are more flexible and supple.

Design characteristics engineered into the new Super Cushion tire primarily to improve car performance, give the effect of smoothing out irregularities of streets and roads with reduction of vibration and increased comfort to driver and passengers, even on the best highways.

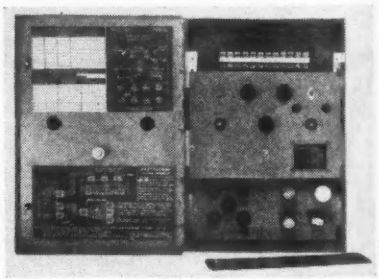
Road shocks are said to be absorbed better with the new tire, particularly lateral shocks which are not cushioned by the car spring system, which is primarily for purpose of softening vertical shocks. Because the new tire is softer and more flexible, it dissipates shocks by dampening out their effects over a wide area of the tire, thus absorbing impacts instead of resisting them.

Cross-section of typical new Goodyear Super Cushion tire and comparable tire it was designed to replace

Current tire in most common use is the 6.00-16 size. On new cars designed to capitalize maximum benefits of all the improvements engineered into the new line, the comparable size is 6.70-15. In all cases, the new tire line is designed for use on 15-inch wheels and rims, averaging 70 per cent of the width of the tire cross-section for new cars introducing the tires in the original equipment market.

F-92—Protective Device for Motor Driven Machines

The Brinnell Co., Granby, Conn. The Protectron, an electronic device for use in conjunction with an electric motor driven machine to "trip" at any preset mechanical load increase above normal. The device is said to be instantaneous in action, sensitive to minute overloads, and adjustable to any degree of overload within practical limits, automatically compensated for fluctuations in terminal voltage.



The Protectron

When the Protectron trips, a red trip warning light is illuminated, and a relay is energized to initiate any desired control function (using auxiliary equipment). It can stop the motor, stop the machine by operating clutch and/or brake, increase or decrease voltage on motor, sound warning signals, etc.

The Protectron combats "jamming" in automatic feed machinery by "sensing" slightly over-sized stock, "pile-ups," dull punches, and other causes before damage occurs, thus protecting tools and dies. By tripping at a preset degree of dullness, it enforces the sharpening of tools, thus increasing tool life. Further, it eliminates refinishing work with "burrs." In certain

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applications such as on a broacher, this setting for dullness is said to eliminate the major cause of various or total damage to the tools.

The Protectron is available for 220/440 volt 60-cycle motors in two models; for operating current of one to five and five to 10 amp. Special models are available for higher operating current, higher voltage or 25-cycle operation.

F-93—Hydraulic Shock Absorbers

The Monroe Auto Equipment Co., Monroe, Mich. A new economy line of direct-double-action hydraulic shock absorbers, carrying the brand name E-Z Ride, a companion in the replacement market to the present standard line of Monroe Airplane Type direct-double-action shock absorbers. Besides being the same direct-double-action type as the standard line, the new E-Z shock absorber has many of the Monroe features of design and construction.

Monroe shock absorber

Conversion sets as well as single shock absorbers are featured in both the Airplane Type and new E-Z Ride lines. They are made for Ford, Chevrolet, Zephyr, Mercury and Studebaker cars.

F-94—Fast Curing Thermosetting Resins

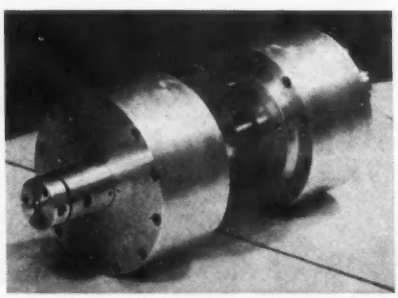
Pittsburgh Plate Glass Co., 632 Duquesne Way, Pittsburgh 22, Pa. Selectron 5000 resins, a series of clear, transparent, fastcuring thermosetting resins developed for many industrial applications. The resins are of the copolymer type, are furnished and applied at 100 per cent solids and are cured at moderate temperatures without the elimination of water or other volatile by-product. They may be cured in the presence or absence of pressure and with or without pigments, dyes, fillers and reinforcing materials.

In order to provide maximum service, a policy has been adopted essentially equivalent to producing "tailor-made" resins. Each member of the Selectron 5000 Series has been designed to meet a specific application or type of application. Thus, monomers are available at almost any viscosity, with differing adhesive qualities and capable of curing under any practical operating conditions. Within limits, Selectron 5000 resins will be made available in specifications individually adapted to each customer's needs.

F-95—Mild-Steel Electrode

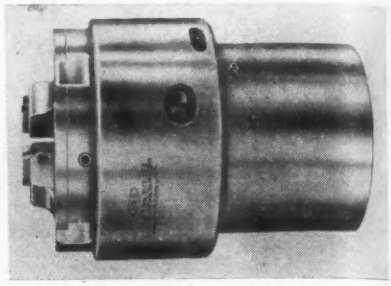
The Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y. Airco No. 312 electrode. This is an all-position, mild steel electrode designed to produce weld metal possessing excellent mechanical properties and low hydrogen content. According to the manufacturer, the improved Airco 312 electrode has two advantages over its predecessor. It can be used on a-c and d-c reverse polarity current. Operating characteristics are said to be equally good on either a-c or d-c reverse. Also, preheating of the electrode is no longer required to obtain porosity-free weld deposits. These deposits can be obtained by using either the stringer bead or the full weave technique.

F-96—Rotating Air Cylinder



The Skinner Chuck Co., New Britain, Conn. New aluminum high speed rotating air cylinders recommended by the maker for installation on machines operating at speeds up to 3000 rpm. These cylinders are made in sizes from 4.5 in. to 12 in. diam; they are aluminum alloy forgings.

F-97—Die Head for Chucking Machines



The Eastern Machine Screw Corp., New Haven, Conn. Style SMM H&G die head. This head was developed especially for chucking machines such as Goss & DeLeeuw. It is a short compact die head yet has a capacity for a wide range of thread sizes. This head is said to be especially suitable for jobs when the machine can tap and thread in the same position.

The recommended uses for this electrode are: welding high-sulphur, free-machining steels; welding hardenable steels where no preheat is used; welding cold-rolled steels which normally exhibit excessive porosity when welded with conventional electrodes; weldments to be vitreous enameled after welding. The extreme low hydrogen content of the improved Airco 312 is said to make possible the production of satisfactorily enameled surfaces without any heat treatment prior to enameling.

F-98—High-Temperature Insulating Materials

Owens-Corning Fiberglas Corp., Toledo 1, Ohio. A line of lightweight high-temperature insulating materials, in felt and bulk form, which will withstand temperatures up to 1,800 F.

Composed of specially processed filaments of glass, the new line is designed for industrial, marine and aircraft applications where a need exists for a flexible, removable type of insulation that will maintain integrity and withstand physical deterioration at extremely high service temperatures. The felt form is now being used to insulate aircraft jet engine cones and tail pipes.

In felt or bulk form, the new high-temperature materials are suitable for insulating housings and flange covers of high-temperature steam turbines, and exhaust manifolds and turbo-supercharger housings on oil or gas-fired supercharged four-cycle Diesel engines. In other applications they can provide a removable and replaceable insulation that can take the place of the refractories, up to now alone available for use in insulating such high-temperature equipment. They can also be employed as the filtering element in fly ash separators used in high-temperature processing equipment.

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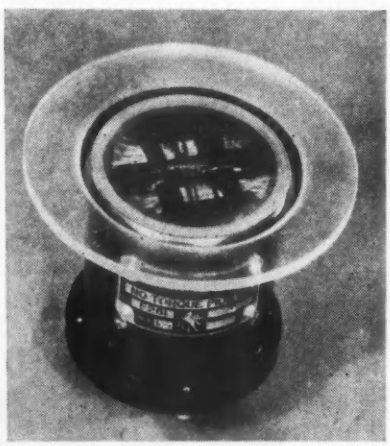
F-99 Grease for Control Bearings

The Texas Co., New York, N. Y. A new grease for use in control bearings and other bearings used in aircraft. It is known as Uni-Temp grease, and through its design to meet problems never before confronting a commercial transport, is an approach to the universal lubricant. A lithium base grease in which a synthetic compound is employed as the oil constituent, it is said to demonstrate a wider range of operating temperatures than other aircraft lubricants. It finds applications not only where extremely low temperatures are encountered, but also where satisfactory performance for short periods at temperatures as high as 300 F. is required.

Matching by itself the performance of three aircraft greases previously required in the application temperature range of —100 F. to 300 F., the new grease may be used in all types of control bearings, wheel bearings, landing gear retraction mechanisms, flap drive systems and tiny electric motors used in governors, remote controls and radar equipment.

F-100—No Torque Instrument Pickup

Fairchild Camera & Instrument Corp., 88-06 Van Wyck Blvd., Jamaica 1, N. Y. The No Torque Instrument Pickup, which will automatically sense the indication of practically any type aircraft or industrial instrument. The pickup does not affect the accuracy of the instrument being read because of no torque requirements.



Fairchild instrument pickup

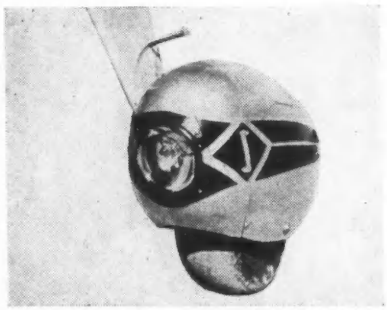
The pickup reads the position of an instrument pointer, then converts this same position into an electrical phase angle. Accuracy of indication is said to be within a few degrees, depending upon associated equipment.

Installed, the No Torque Pickup replaces the covering glass window on the instrument. A small permanent magnet is then mounted on the indicator shaft whose position is to be read.

There is no mechanical connection between the pickup and the instrument, and there are no moving parts in the pickup itself. In operation, indication is obtained by the phase of the magnetic couple between the stationary magnetic field of the instrument pointer and the rotating field of the instrument pickup. A piezo-electric crystal is used to convert this mechanical couple into an electrical voltage. The phaes angle of this voltage is then a function of the position of the indication pointer.

F-101—Landing Lights

Aviation Accessories Corp., Fort Worth, Tex. Lightstream wheel lights for civilian aircraft. For aircraft having fixed landing gear, the lights, mounted in protective wheel pants, are attached quickly to the landing gear. The Plexiglas lenses protect the lighting units from erosive material, such as small stones, picked up by propeller wash. Since Plexiglas is highly impact-resistant, the new lenses are said to withstand hard jolts and vibrations without breaking and splintering. Each lens is adjusted so that the light beam strikes the ground at 400 ft in front of aircraft in level flight at an altitude of 15 ft prior to landing stall. On retractable landing gear aircraft, special cuts are made to install the lights.

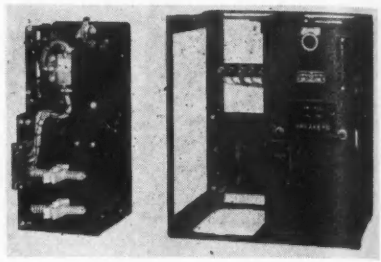


Lightstream wheel lights

F-102—Generator Power Center

The Aviation Division of the General Electric Co. A new generator power center for aircraft which groups together all generator control equipment in small removable panels.

The new power center contains the voltage regulator, reverse current relay, directional circuit breaker, power disconnects, control disconnects, and control circuit protection equipment. Each of the panels, which draw out of their frames, weighs a maximum of 15 lb.



G-E generator power center showing two panels, one removed from the

Each panel is 6⅛ in. wide, 14 in. high, and 10¼ in. deep. Clearance of 9 in. is required in front for removal of the panels. Any combination of panels can be obtained. Arrangements can be made one panel wide, two panels high; two panels wide, one panel high; two panels wide, two panels high, etc. Outgoing power bus can be supplied as well as bus sectionalization with the correct circuit breaker protection.

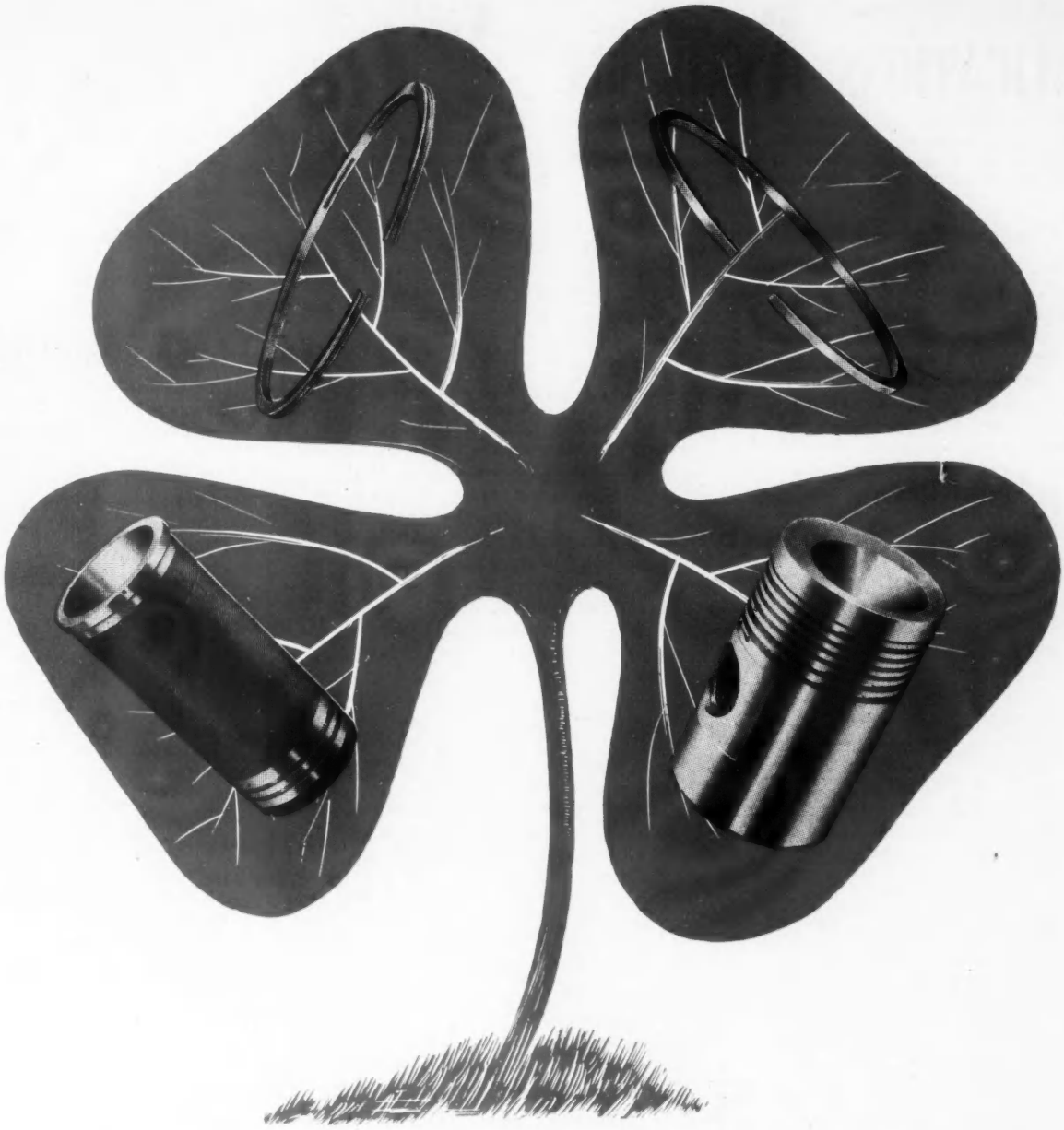
F-103—Miniature Vacuum Tube

The Eclipse-Pioneer Division of Bendix Aviation Corp., Teterboro, N. J. The "Chronotron," a new miniature vacuum tube with time-delay characteristics. Of special value in electronic control circuits when a rate factor and time delay are needed, the Chronotron is said to be already proving itself a vital element in critical instrumentation, such as the servo system used for Eclipse-Pioneer automatic landing approach for aircraft, and in automatic steering for marine craft.

Basic principle of the Chronotron is thermal conductivity, or the flow of heat from one side of an insulator to the other when a differential in temperature exists. The time required for the heat to penetrate the insulator provides the time delay of the tube output signal. Time constants of the Chronotron range from ten seconds to two minutes, depending on the insulating substance used.

The new tube has advantages that invite a wide use. It is unaffected by

(*Turn to page 66, please*)



Lucky for Leadership

Somebody has said that luck is mostly hard work. Maybe it's lucky for Sealed Power that we began operations away back in 1911 when automobiles were a young idea. Maybe we're lucky that Sealed Power products were so good they have been used as standard equipment by leading engine builders ever since. Maybe it's luck that today's Sealed Power plants, equipment and staff are the finest in our 36-year history. You are invited to share our luck. Let this unequalled combination of facilities help you make your good engines even better!

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PUBLICATIONS AVAILABLE

Publications listed in this department are obtainable by subscribers through the Editorial Department of AUTOMOTIVE INDUSTRIES. In making requests please be sure to give the NUMBER of the item concerning the publication desired, your name and address, company connection and title.

D-62—Coating Processes

Harper J. Ransburg Co.— new 16-page booklet is available, describing electrostatic painting methods. It includes illustrations of many typical electrostatic spray installations in as many industries with brief case histories on some of them. A variety of electrostatic detearing operations also are pictured. One section explains the principles of electrostatic spray. Other sections have valuable information for paint superintendents, chemists, production engineers, etc.

D-63—Automatic Chucking Machines

New Britain-Gridley Machine Div., New Britain Machine Co.—A new catalog containing information on Models 475, 49 and 412 Four-Spindle automatic chucking machines. Several views of each model are contained in the catalog, together with information on the various features, constructional details specifications, standard equipment supplied and extra equipment available.

D-64—Heavy Duty Diesel Engines

The Buda Co.—An attractive booklet on Buda heavy duty engines pictures and describes four models of Buda heavy-duty Diesel engines. The design features and lubrication system are both clearly explained and illustrated. Many photographs of actual operations are also included.

D-65—Burs and Accessories

Pratt & Whitney Div., Niles Bement-Pond Co.—An attractive catalog on Keller Burs and Accessories has been issued as a companion piece of literature to the Kellerflex Machine Catalog. The company's entire flexible shaft line —including all attachments, accessories and tools, is covered in the two books. The Bur catalog contains much heretofore unpublished information concerning burs in general, and particularly the newest carbide burs.

D-66—Die Castings

The Electric Auto-Lite Co.—A 16-page catalog describes die casting activities at the company's plant at Woodstock, Illinois. It describes facilities for machining, finishing and plating all zinc or aluminum die cast parts.

D-67—Valves

Hanna Engineering Works—Bulletin No. 235 gives specifications and operating data on all Hanna Valves. The line consists of foot-operated and hand-operated valves for air and hydraulic lines and speed control valves for use with air and hydraulic cylinders.

D-68—Truck Body Catalog

Fruehauf Trailer Co.—A 12-page color catalog describes the new Fruehauf all-steel truck bodies. It also illustrates various door arrangements and other options which provide a choice of over 500 different body combinations.

D-69—Laminating Resins

American Cyanamid Co., Plastics Div.—A new, well-illustrated 4-color booklet describes the company's Laminac Laminating Resins. Applications already in production as well as potential uses for these plastic materials, for laminates or formed parts, are illustrated and discussed.

D-70—Euclid Model T Rear-Dump

The Euclid Road Machinery Co.—A new, illustrated catalog folder describes the Model T Rear-Dump Euclid, powered by a 275 h. p. Diesel engine. The frame and drive axle also are pictured and described and complete specifications are included.

D-71—Induction Heating

Ajax Electrothermic Corp.—Bulletin 13-A gives valuable information on forging, upsetting, spinning, hardening, etc. with Ajax Northrup induction heating. The bulletin is well illustrated and includes data on the prin-

(*Turn to page* 76, *please*)

TIME SAVER COUPON *for your convenience in obtaining, WITHOUT OBLIGATION, more information on any one or more of the publications described above OR New Production and Plant Equipment OR New Products items described on following pages.*

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● *Built by Silent Hoist & Crane Co.*

Handling loads up to 10 tons as easily as you'd lift a pencil, this "SILENT HOIST" Power Swinging, Power Topping Boom Crane for motor trucks is used for loading and unloading freight cars, trailers, trucks, etc. SKF Self-Aligning Ball Bearings are located on the mast, winch hoist unit, and boom swinger unit. Not only do they compensate for shaft deflections, distortions or weave, but they assure correct alignment, dependability, long life, and low maintenance costs. Let SKF help *you* put the right bearing in the right place, too. 6304

SKF INDUSTRIES, INC.
Front St. and Erie Ave., Phila. 32, Pa.

Northrop's Flying Wing

(*Continued from page* 37)

power plants both operate at relatively high speed for best fuel economy, the advantages of the all-wing configuration, when used with these power plants, will closely approach the above figures for maximum range as well as high speed.

There are other major advantages of the all-wing type which contribute to improvement in efficiency and range. The most immediately applicable is the improved adaptability of all-wing types to the distribution of weight empty and useful load over the span of the wing. Such weight distribution results in substantial savings in structural weight which have important effects on the ratio of gross weight at takeoff to landing weight.

Future Possibilities

Further aerodynamic refinement in all-wing craft can be made through the use of turbo-jet engines, boundary layer control and thinner wing sections. In future designs, it is estimated that the total minimum profile drag of the all-wing airplane will be from 40 to 59 per cent that of the conventional airplane. Thus, the power required to maintain the all-wing at the same cruising speed as the conventional would be from 70 to 80 per cent; and the maximum range of the all-wing, at the cruising speed of the conventional airplane, would be 143 to 125 per cent. The maximum range of the all-wing airplane at its best cruising speed would be 158 to 130 per cent of the conventional; and the most economic speed, from 150 to 115 per cent faster. Under high speed conditions corresponding to full power of reciprocating, turbo-prop or turbo-jet engines where the induced drag is assumed to be 20 per cent and the parasite drag 80 per cent of the total, the power required to drive the all-wing airplane at the speed of the conventional ship would be 52 to 67 per cent; and the range, 192 to 149 per cent of the conventional airplane. The maximum speed of the all-wing airplane at comparable powers would be 124 to 114 per cent of its conventional counterpart. These values are superimposed on present performance characteristics of the all-wing airplane in Fig. 1 to give an idea of possibilities for future improvement.

Supersonic Flight

Based on present knowledge of supersonic flight, it will always be more difficult to carry a given pay load for a given range at supersonic speed because of the additional wave drag encountered. At transonic or comparatively low supersonic speeds a plan sweptback wing appears to be one of the best possible configurations, providing sufficient volume is available within the wing. Since the flow normal to the leading edge is subsonic over almost the entire wing surface, subsonic airfoils with reasonably good subsonic flight characteristics can be used at these speeds. The all-wing design eliminates wing-fuselage interference as well as adverse interference between the tail surfaces and wing or body.

At higher supersonic speeds, the problem of providing adequate volume is more difficult due to the fact that more and more fuel is required for a given range and that the percentage of thickness of airfoils suitable for such use is much less than satisfactory for subsonic flight. This problem of volume and size might well rule out the all-wing airplane for supersonic use, and certainly does limit its usefulness for low altitude flight. However, an attrac-

(*Turn to page* 64, *please*)

Constant laboratory research backed up by 30 years experience in the manufacture of brake lining in both automotive and industrial fields keeps Grizzly constantly alert to developments resulting in finer brake lining. This same research and experience enables Grizzly to solve brake lining problems of widely divergent natures —helps keep Grizzly in its enviable position of one of the largest, most dependable producers of molded brake lining.

When you are confronted with a brake lining problem, follow the example set by other production, engineering and purchasing men and bring your problem to Grizzly. Grizzly research and all-around manufacturing experience can be of importance to you.

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PAULDING, OHIO
PLANTS AT PAULDING AND BELL, CALIF.
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The Modern Electric Resistance Welded Steel Tube

ROUND
SQUARE • RECTANGULAR

¼" to 4" O.D.
9 to 22 gauge

½" to 2" 20 gauge—1" to 2¼" 14, 16, 18 gauge

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Flying Wing

(*Continued from page* 62)

tive field of operation exists at a very high altitude where air densities are low and therefore wing areas must be comparably great if suitable lift coefficients are to be maintained. If a supersonic airplane were designed to fly at a Mach number of 1.6 with supersonic diamond-section airfoils, the maximum cruising lift coefficient would probably be no greater than 0.15, and the corresponding loading would have to be held to 40 lb per sq ft. These figures are based on assumed operation at 60,000 ft and an air density ratio of 0.094. Such an airplane might likewise be suitable for landing and takeoff at low altitude in view of its comparatively light wing loading, which would eliminate the necessity of high-lift devices. The practicability of the design would depend on the relative density of the air at the altitude selected for cruising operation. If a sufficiently high altitude were chosen it would seem quite possible that adequate volume could be secured in the wing, in spite of its small thickness ratio, by using low aspect ratio planforms approaching the triangular.

Fig. 2 shows comparative data on two wings having the same physical depth at the root, and identical wing areas. The conventional wing is of a type already proved practical for all-wing airplanes. The delta wing has thickness ratios suitable for supersonic flight, identical thickness and only slightly reduced volume. It should be quite suitable for all-wing aircraft of reasonable size. From the aerodynamic point of view it appears that with the delta wing it is possible to eliminate a substantial portion of the wave resistance, and thus realize fairly favorable lift-drag ratios at supersonic speeds.

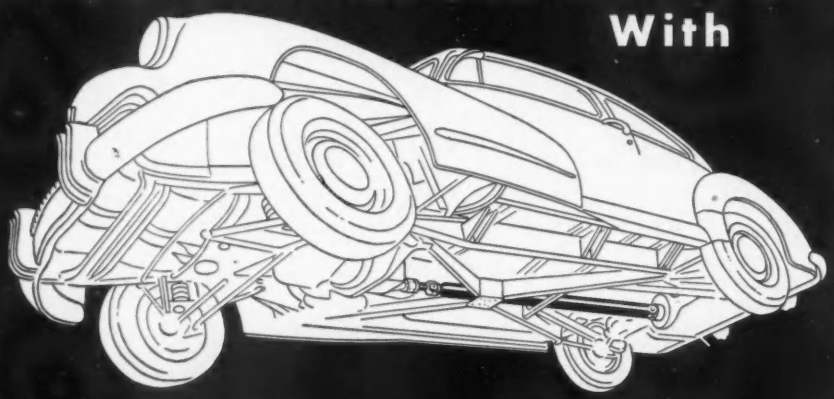
Body by Fisher

(*Continued from page* 30)

of the front seat frame in the body. It can best be appreciated by reference to the illustration. It is so positioned and pivoted as to make it possible to transfer seat frames from the moving monorail right into the body.

In retrospect, the body has been in continuous movement from the time the underbody was installed on the body truck and has remained on the truck until ready for delivery to Chevrolet. It has been subjected to a multiplicity of inspection operations at every stage and at intervals bodies have been taken off the line for overall inspection on master checking fixtures. Superimposed on this regular procedure is the sampling inspection to assure water tightness and other characteristics.

YOU CAN REDUCE WEIGHT With



MECHANICS *Roller Bearing* UNIVERSAL JOINTS

The slip-on-the-transmission-shaft feature of this MECHANICS Roller Bearing UNIVERSAL JOINT eliminates the need for the conventional splined stub shaft, thus reducing weight and cost. Let our engineers show you how this and other MECHANICS features will help give your product competitive advantages.

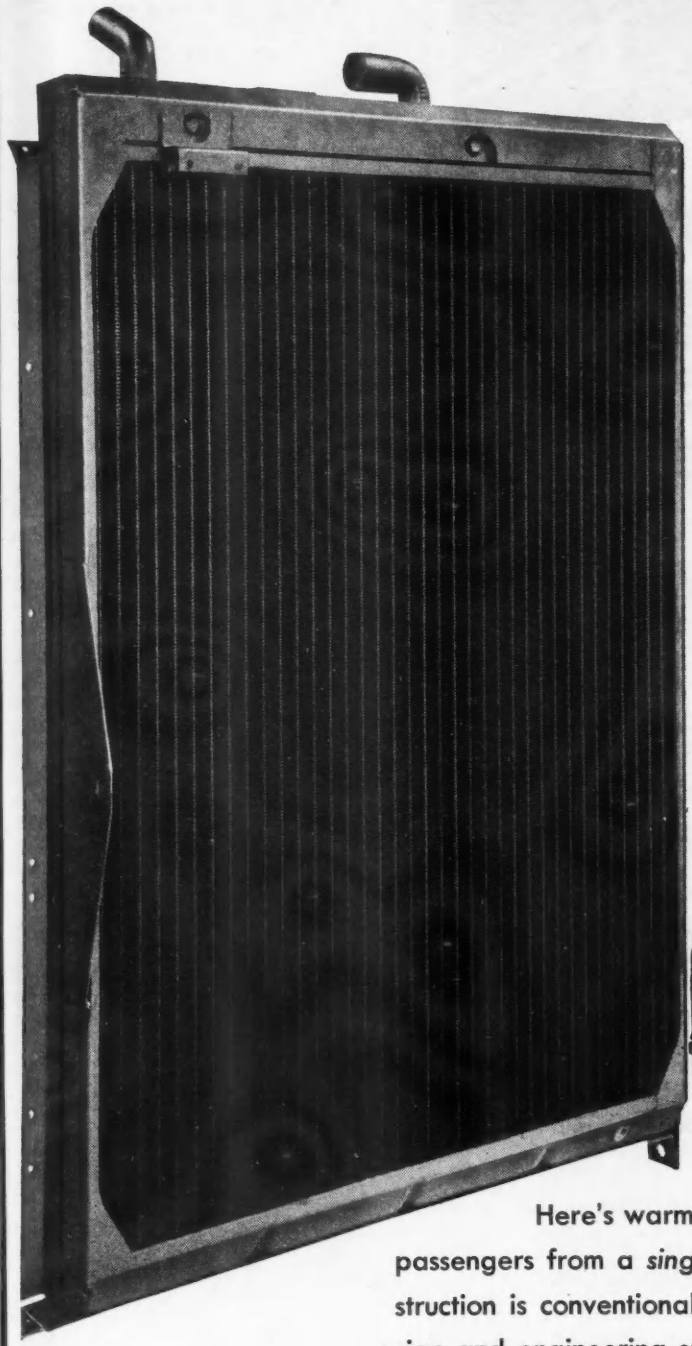
MECHANICS

MECHANICS UNIVERSAL JOINT DIVISION
Borg-Warner
2020 Harrison Avenue, Rockford, Ill. Detroit Office, 7-234 G. M. Bldg.

CALENDAR

Conventions and Meetings

Society of Automotive Engineers—Tractor Mtg., Milwaukee....Sept. 17-18
Natl. Machine Tool Builders Assoc. Machine Tool Show, Chicago, Sept. 17-26
Automotive & Aviation Parts Mfgrs. Assoc., Cleveland—Annual Mtg.—Sept. 29
Soc. Automotive Engineers, Aeronautic Mtg., Los Angeles .....Oct. 2-4
French Automobile Salon, Paris...Oct. 2-12
Amer. Soc. of Mechanical Engineers, Petroleum Mech. Eng. Conf., Houston, Tex. .....Oct. 6-8
Societé des Ingenieurs de l'Automobile . Paris—20th Anniversary Mtg., Oct. 10-12
Natl. Conference of Industrial Hydraulics, Chicago .....Oct. 16-17
Soc. of Automotive Engineers, Production, Cleveland .....Oct. 20-21
Amer. Soc. Tool Engineers—Semi-Annual Mtg., Boston.....Oct. 30-Nov. 1
Natl. Tool & Die Mfg. Assoc.—Annual Mtg., Phila. .....Nov. 2-5
Natl. Electrical Mfrs. Assoc., International Lighting Exposition & Conference, Chicago .....Nov. 3-7
Amer. Soc. of Body Engineers, Annual Tech. Convention, Detroit, Nov. 5-7
Society of Automotive Engineers, Fuels, & Lubricants Mtg., Tulsa.....Nov. 6-7
Society of Automotive Engineers-Air Transport Mtg., Kansas City..Dec. 1-3
Amer. Soc. of Mechanical Engineers, Annual Mtg., Atlantic City....Dec. 1-5
Automotive Service Industries Show, Chicago .....Dec. 8-12
Soc. of Automotive Engineers Annual Mtg., Detroit .....Jan. 12-16
Natl. Auto. Dealers Assoc. Exhibition, Chicago .....Jan. 25-29



DOORWAY TO COMFORT

Here's warmth for an entire bus load of passengers from a *single* heater. Tube-and-fin construction is conventional—all other elements of design and engineering specifically qualify this *better* heater for the space heating requirements of the largest highway bus.

LONG MANUFACTURING DIVISION
BORG-WARNER CORPORATION
Detroit 12, and Windsor, Ontario

A PRODUCT OF B-W BORG-WARNER

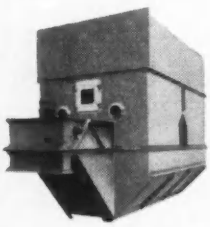
LONG
CLUTCHES • RADIATORS • OIL COOLERS

Eats DUST and FUMES from YOUR production

Schmieg CENTRI MERGE DUST and FUME Eliminator

AUTOMATICALLY

- **COLLECTS** —at point of origination.
- **CLEANS** —by high pressure water action.
- **DISPOSES** —by mechanical conveyor in the form of sludge.



Like a huge octopus, with its tentacles (ducts) reaching out to every working area where contamination of air occurs, the Schmieg CENTRI-MERGE Eliminator sucks up and consumes all dangerous dust and fumes—literally eats them up.

Picked up at the point of origination—BEFORE *any damage can be done*—dust and fumes ride an air stream through the ducts to the Collection Unit. Here CENTRI-MERGE goes into action—washing—scrubbing—pounding out the dust and dirt in a tornado of cleansing water. Dust particles are deposited—under water—in a sludge tank at base of Unit.

Right now — today — CENTRI-MERGE Eliminators are removing the hazard of dust and fumes from scores of plants—doing a more thorough job than any other method—and doing it more economically. We welcome the opportunity of proving what CENTRI-MERGE can do for you.

THE *best* AIR PURGE is CENTRI MERGE

Schmieg INDUSTRIES INC.
Engineers & Manufacturers

310 PIQUETTE AVENUE • DETROIT 2, MICHIGAN

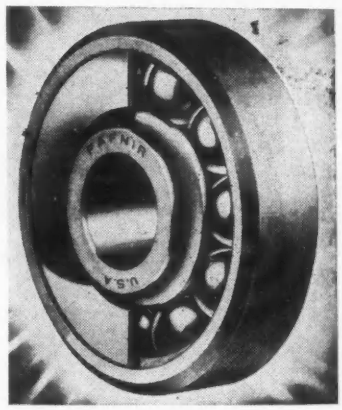
New Products for Aircraft

(*Continued from page* 58)

large variations in ambient temperature and humidity. Its small size offers space and weight advantages. Since no part operates at excessively high temperatures, the Chronotron has practically unlimited life. Furthermore, it can be used to replace certain unreliable circuit components, as well as certain mechanical devices.

F-104—Sealed Ball Bearings

The Fafnir Bearing Co., New Britain, Conn. Plya-Seal bearings. Latest of the Fafnir control bearing sto be converted to the Plya-Seal is the 3/16-in.-bore rod end. In its case a slight modification in design was necessary to accommodate the Plya-Seal, but the adaptation of Plya-Seals to other standard "A-N" Fafnir control bearings is being effected without disturbing any boundary dimensions. Types of Fafnir control bearings now made with Plya-Seals include: heavy, medium and light duty deep groove, single row ball bearings of the K, K-A, KF, KF-A, SLK, and extra heavy duty bearings in the KF-H groups; double row ball bearings of the D, DF series and the self-aligning DS series; wide double row bear-



Cut-away view of Plya-Seal bearing

ings for bellcrank mountings; track rollers, clad cable support bearings and rod ends; aircraft control pulley bearings replacing the outmoded AN-210 series; type Y helicopter rotor cyclic pitch control bearings.

The Plya-Seal is a flexible seal washer of plastic impregnated fabric, non-capillary and impervious to liquids, grease, oil, gasoline, water, steam and solvents. It is not affected by heat or cold, does not age. It is secured firmly to the outer ring of a ball bearing by a stainless steel split retaining ring which snaps into place. The impregnated washer does not rotate with the inner ring but slides on a smooth radius on the inner to form a snug seal with minimum friction.

No. 4 OF A SERIES: *"How Du Pont Explosive Rivets do an Efficient, Economical Fastening Job—Fast"*

TESTS PROVE STRENGTH OF EXPLOSIVE RIVETS

for primary fastening jobs

Du Pont Explosive Rivets are strong, one-piece fasteners. They approximate the strength of conventional solid rivets and prove ideal for many primary and secondary fastening jobs. Manufacturers are using them to simplify difficult fastening operations...to make ordinary fastening jobs easier . . . and to speed up the work.

The table shows results of shear and tensile strength tests of aluminum, copper, and brass Explosive Rivets in single rivet steel sheet specimens:

Single shear test of 5/32"-diameter brass Explosive Rivet. Specimen broke at 940 lbs. on Southwark-Emery Testing Machine in Du Pont Explosives Research Laboratory.

Close-up of the test specimen. Tensile strength tests are also made on the apparatus.

STRENGTH DATA FOR TYPICAL EXPLOSIVE RIVETS

	NOMINAL RIVET DIAMETER	RIVET DESIGNATION	SHEAR Lbs. Rivet	SHEAR Lbs. Sq. In.	TENSILE Lbs. Rivet	TENSILE Lbs. Sq. In.
52S ALUMINUM ALLOY	1/8"	52SB-1/8" x 3/16"	187	15,200	290	23,600
	5/32"	52SB-5/32"x 3/16"	291	15,200	441	23,000
	3/16"	52SB-3/16" x 3/16"	420	15,200	630	22,900
17S-T ALUMINUM ALLOY	1/8"	17ST-134A-20	500	35,200	500	35,200
	5/32"	17ST-173A-20	823	35,600	836	36,200
	3/16"	17ST-204A-20	1172	36,400	1156	35,900
COPPER	1/8"	CUB-1/8" x 3/16"	284	23,000	429	35,000
	5/32"	CUB-5/32" x 3/16"	426	22,300	675	35,300
	3/16"	CUB-3/16" x 3/16"	582	21,200	845	32,400
BRASS	1/8"	BRB-1/8" x 3/16"	425	34,600	603	49,200
	5/32"	BRB-5/32" x 3/16"	641	33,600	882	46,100
	3/16"	BRB-3/16" x 3/16"	874	31,900	1345	51,700

How Explosive Rivets Produce Strong, Tight Joints. Cavity in shank of Explosive Rivet contains minute, non-corrosive charge. Heat from Du Pont Riveting Iron applied to head of Rivet fires the charge. Shank expands . . . completely fills prepared hole. Barrel-shaped head formed on opposite end of Rivet locks it securely in place.

It's a quick, easy, one-man job. No rivet-finishing operations necessary. No parts to vibrate loose. Explosive Rivets save time . . . may help reduce your installed fastener costs. Look into them today. Write for manual containing complete information. E. I. du Pont de Nemours & Co. (Inc.), Explosives Dept., Wilmington 98, Delaware.

OUTSTANDING FEATURES OF EXPLOSIVE RIVETS

1. Easy to insert . . . close hole tolerances unnecessary.
2. Quick to set . . . 15 to 20 Rivets a minute.
3. Large grip range permits wide use of each Rivet size.
4. Strength comparable to solid Rivets.
5. One piece . . . no parts to vibrate loose.
6. No rivet-finishing operations required . . . neat appearance.
7. Safe to handle . . . use . . . store.

DU PONT EXPLOSIVE RIVETS

A Product of Du Pont Explosives Research

BETTER THINGS FOR BETTER LIVING ...THROUGH CHEMISTRY

DU PONT
REG. U. S. PAT. OFF.

Tooling Plans for the Davis D-2 Car

(*Continued from page* 39)

of contour or fit will become immediately noticeable. The solution to the problem has become remarkably simple and at the same time has enabled designing the first car in which virtually every body panel is quickly and easily removed. The problem of fairing and attachment has been solved by attaching exterior body panels to structural bulkheads by bolting through mounting clips. The mounting clips, in turn, are serrated on their bases and rest on serrated pads on the bulkheads. Body panels are installed by checking alignment with a tool and then tightening the bolts which hold the mounting clips to their pads. The serrations provide a non-slip surface for the clips and the panels can then be removed and replaced repeatedly without disturbing their smooth fairing.

The entrance doors are also simply aligned. Spacer tools are placed around the door jamb to provide proper clearance. The doors are then squeezed shut against the rubber draft seal by means of a clamping fixture which provides positive location. Once the doors are so held, the hinges, which are easily accessable are adjusted in place using the serrated pad method. Washer spacers are placed on the hinge pins as necessary.

Chassis Production

The chassis has been designed primarily of three in. diam seamless tubing with necessary mounting brackets arc-welded thereto. The main rails are interchangeable before welding and are directed from the forming operation down a short gravity conveyor to right and left hand weld fixtures. These fixtures are arranged to support the rails in the proper attitude and the mounting brackets which are here welded on are located rigidly on pads by means of their body, or engine, or running gear attachment holes during the welding operation and the inspection which follows. The welded rail assemblies now flow down another short gravity conveyor to be welded into a complete chassis. At this point the welded rail assemblies are located in a larger weld fixture which again locates to the same attach holds that were used when welding the chassis cross members.

After the weld operations are completed, the unit is rotated on its weld fixture to a side-vertical position and picked up by an overhead conveyor. The chassis is conveyed down into a cleaning and deoiling bath, through a hot water rinse, past air jets which blow off excess water, and into an infra-red light heating and drying oven. Here all excess moisture is evaporated and the temperature of the whole raised to the neighborhood of 140F. The moving conveyor now carries the chassis through an electronic paint spray booth which utilizes an electric-magnetic method to completely coat all parts of the chassis with protective, quick drying, paint. The chassis is now ready to receive bolted installations and is directed to the vicinity of the assembly line.

Final Assembly Sequence

Through detailed study and analysis the work to be accomplished on the final line has been reduced to 12 basic stations and all other work arranged to be accomplished in sub-assembly, either by the Davis Motorcar Corp. or by subcontractors. Our final line is arranged in two phases. The first phase is the first four stations. In these positions the chassis rolls on a dolly along an elevated platform and the running gear is installed. In the second phase the chassis rolls on its own wheels and the body is installed unit by unit. The following brief summary illustrates the extreme simplicity of the assembly operations:

Station 1—Install motor and transmission unit. Attach (but do not

(*Turn to page* 70, *please*)

They Contribute to

SMOOTH PERFORMANCE

DOLE Thermostats

—in a range of types for every car

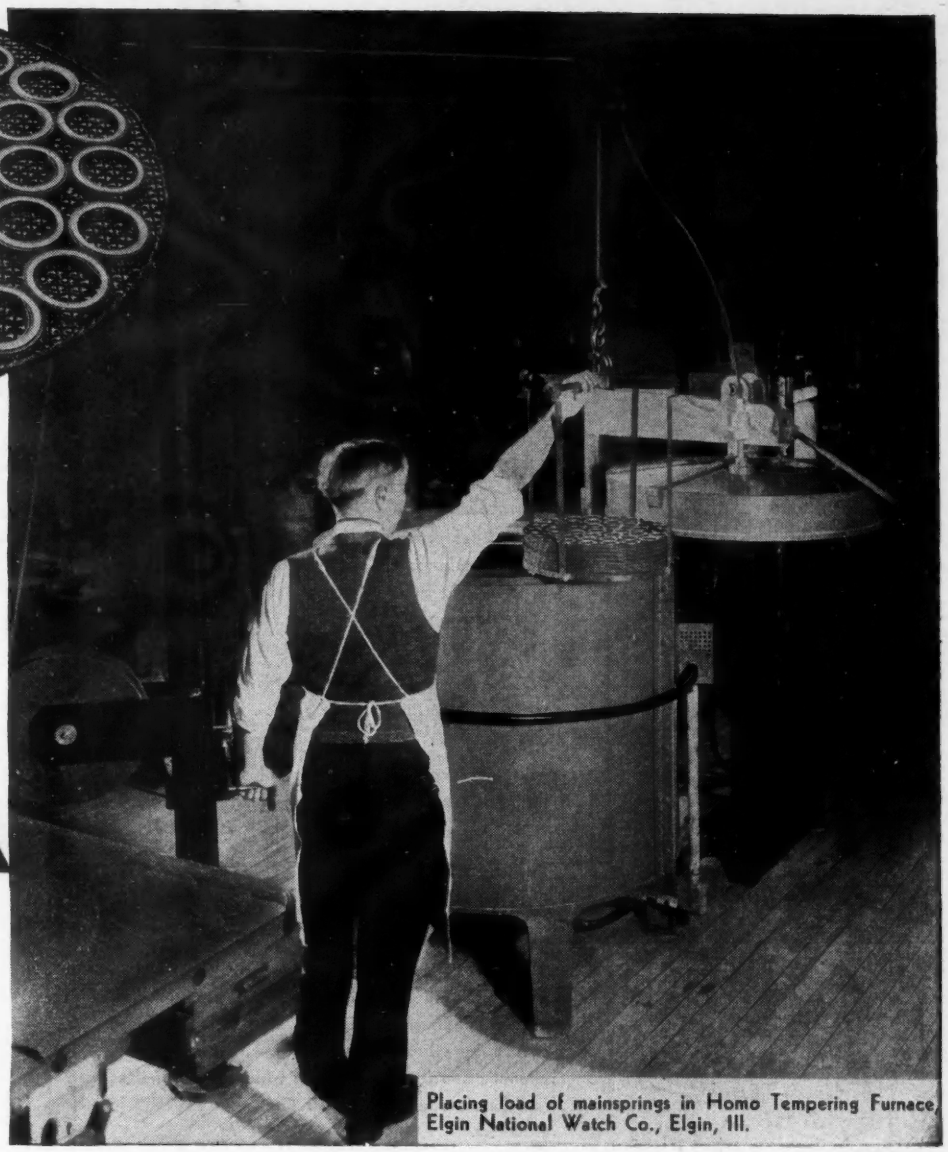
Specifically, Dole Thermostats provide quicker warm-ups all year 'round—with important savings in gas, oil and motor wear. Smoother operation and name-building performance are more readily achieved through positive motor temperature control.

THE DOLE VALVE COMPANY

1901-1941 Carroll Avenue Chicago 12, Illinois

LOS ANGELES • DETROIT • PHILADELPHIA

Batch of watch springs, and typical Elgin watch.



Placing load of mainsprings in Homo Tempering Furnace, Elgin National Watch Co., Elgin, Ill.

DURA POWER

Springs

FOR ELGIN WATCHES

Homo-Tempered in Batches of 20,000

Even though tempered in big batches, Dura Power mainsprings for Elgin watches are so well tempered by the Homo Method that they more than meet all requirements for uniformity and high quality.

In Elgin's operation, a batch of springs consists of 20,000 to 25,000 units, and weighs 55 to 60 pounds. Homo Tempering brings the work up to the required temperature quickly, yet heats so gently that there is no thermal shock to the projecting ends and other thin sections of the springs. Both heating and soaking cycles are maintained automatically . . . furnace operators are available for other duties during these parts of the heat-treatment.

The forced convection method of heating (which Homo pioneered) not only produces fine results but is, as Homo uses it, highly efficient. Clean, electrically-heated air is forced past the heater and through the load by a powerful fan located only inches below the work. The air stream holds its swirl as it hits the work space; penetrates it evenly; tempers so uniformly that rejects become almost unknown.

Homo is available in many sizes, for many different uses. If you have a specific tempering problem, an L&N field engineer will gladly talk it over with you; or he'll send Catalog T-625, as you prefer. Address Leeds & Northrup Co., 4966 Stenton Ave., Phila. 44, Pa.

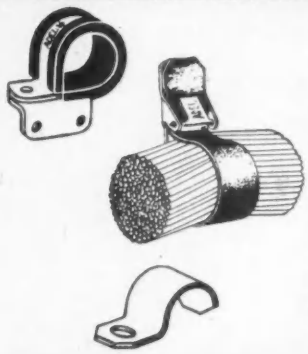
MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

LEEDS & NORTHRUP CO.

Jrl. Ad T-625 (34)

For Positive Vibration-Free Support

ADEL LINE SUPPORT CLIPS

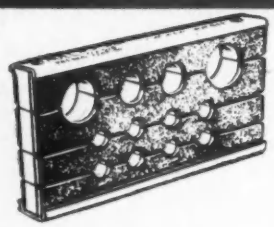


ADEL Clips provide a simple, rugged, low cost support for tubing, piping and electrical cables. Manufactured in over 13,000 different types and sizes. Over 330 million now giving dependable support in aircraft, marine and industrial installations.

ADEL Shock Absorbing Clips give cushioned support—insulate lines from vibration and wear.

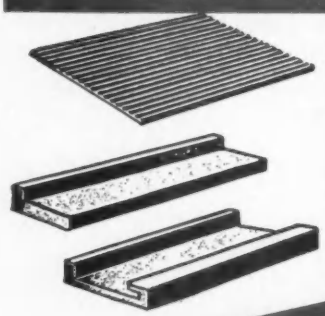
ADEL Cable Harness Straps are self-adjusting supports accommodating single cables or any combination of wires. Positive locking device permits easy repair or replacement of wires. Loads to 2800 lbs.

ADEL LINE SUPPORT BLOCKS



A low cost, easily installed support for multiple grouping of lines. Provides rugged, resilient support eliminating line failures and fitting leakage caused by vibration. Available with hard maple, phenolic or **ADELITE** blocks in wide variety of sizes for accommodating 1 to 30 lines, ⅛" to 2½" in diameter.

ADELITE SYNTHETIC RUBBER



ADELITE—a tough, wear-resistant compound 26 to 33% lighter than conventional synthetic rubber. Impervious to aromatic vapors and liquids. Extremely low compression set. Permanent resiliency. Excellent sound insulating characteristics. Any hardness from 30 to 80 Shore Durometer. Available in wide variety patterns including channels, gaskets, pads, floor coverings and other molded forms.

Write for illustrated catalog containing complete specifications on more than 13,000 ADEL Clips and Blocks for aircraft, industrial and marine service.

ADEL PRECISION PRODUCTS CORP.
BURBANK, CALIF. ★ HUNTINGTON, W. VA.

ADEL

Manufacturers of: Aircraft Hydraulic Systems • Marine & Industrial ISOdraulic Controls • Halfco Self-Aligning Bearings • Line Support Clips & Blocks • Industrial Hydraulic Equipment • Aircraft Valves • Industrial Valves

Davis D-2 Car

(*Continued from page* 68)

secure) rear wheel and drive shaft assembly.

Station 2—Hook up drive shaft and radius rods. Install fuel tank, bellcranks and fulcrum for transmission controls, forward bulkhead (ahead of engine).

Station 3—Install rear springs and hook up sway brace, front wheel and yoke assembly, hydraulic brake cylinder, radiator core and hoses.

Station 4—Install rear bumper assembly, exhaust pipe and muffler, fuel line, fan and belt, fixed hydraulic brake lines, front springs.

Station 5—Install center section assembly. This is a major sub-assembly consisting in part of fire wall, cowl, windshield, dash, steering wheel and post, forward door posts, floor, rear door posts, rear bulkhead, rear shelf, etc.

Station 6—Complete attachment center section, attach steering gear box, complete hook-up of shift linkage, install lower nose fairings (forward), and luggage compartment floor.

Station 7—Install steering push rod, hood assembly, rear fender panels, seat support channels, upper nose fairing.

Station 8—Install splash fenders (inside luggage compartment). Adjust fairing of headlight doors, install doors.

Station 9—Install luggage compartment, passenger seat assembly, forward side panel-splash pan assemblies.

Station 10—Check and adjust hood fit. Check and adjust luggage compartment lid fit. Visual check interior.

Station 11—Install top assembly and fender skirts. Add fuel and oil.

Station 12—Check lights and horn. Start motor. Drive away.

Sub-Assembly

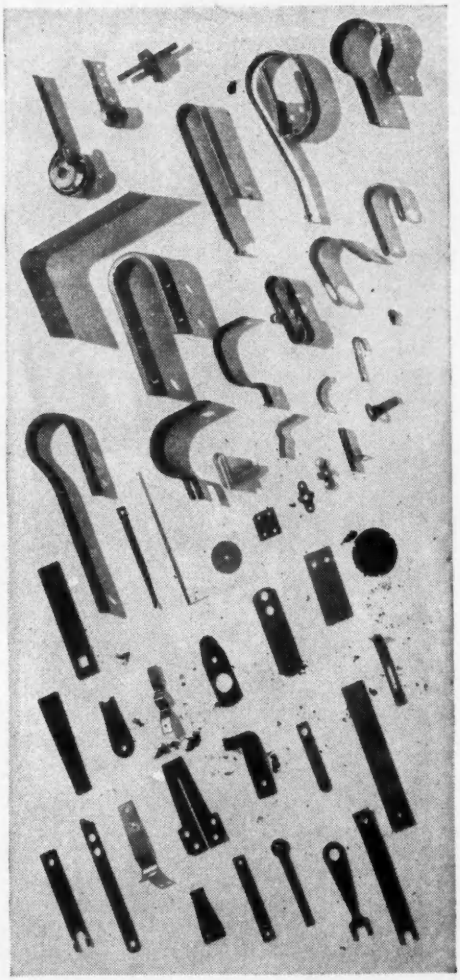
Sub-assembly work is treated in the same manner as final assembly. It is simplified to the Nth degree. An excellent example is the top assembly. The top assembly consists of an aluminum shell housing, on a steel superstructure. The top shell is welded and trimmed in a fixture designed to match it to the body contours. The superstructure is then jig located and bolted in. All of these operations take place with the top in an inverted position. Lastly the top is coated with rubber cement and a rubber blanket set in. The upholstery is then stitched in and the top is ready for joining to the car. The weight of the completed top is less than 50 lb.

In conclusion it may be added that every effort has been made to design for the utmost in servicing facility. The side panels and splash pans can be removed in approximately three minutes, by one man with a common end wrench, and the whole engine assembly is bared. No pains have been spared to make the car as light and as simple as possible.

Wilco Thermometals

(THERMOSTATIC BIMETALS)

that BEND to Your will!



The versatile Wilco Line includes 29 WILCO THERMOMETALS which help manufacturing customers meet all conditions of bimetal application . . . all applications where response to temperature is required.

In Wilco's versatile line are Wilco Thermometals (Thermostatic Bimetals) that "bend" to your will . . . that precisely meet your requirements. Wilco Thermometals are designed for a wide variety of uses including . . . Temperature Indication . . . Temperature Control . . . Temperature Compensation . . . and Sequence Control.

CHARACTERISTICS—Wilco Thermometals cover temperature ranges of maximum resistance from 50° to 800° F... useful deflection from minus 100° to plus 1000° F... and include a wide range of electrical resistances.

PERFORMANCE—Wilco Thermometals give precision performance in hundred of applications, including Circuit Breakers, Furnace Controls, Flatirons, Safety Pilots, Electric Blankets, Carburetors, Cigarette Lighters, Fluorescent Light Starters and Automatic Toasters.

AVAILABILITY—Wilco Thermometals are supplied in all shapes, including strip, straight cantilever blades, U-shapes, spirals and helices . . . or as parts of assemblies with shafts, studs, brackets, contacts, braids or springs. Whatever your requirements for Wilco Thermometals, Wilco engineers will gladly help you.

WILCO PRODUCTS INCLUDE:

THERMOSTATIC BIMETAL—All temperature ranges, deflection rates and electrical resistivities.

CONTACTS—Silver-Platinum-Tungsten-Alloys-Sintered Powder Metal.

SILVER CLAD STEEL

JACKETED WIRE—Silver on Steel, Copper, Invar or other combinations requested.

ROLLED GOLD PLATE AND WIRE

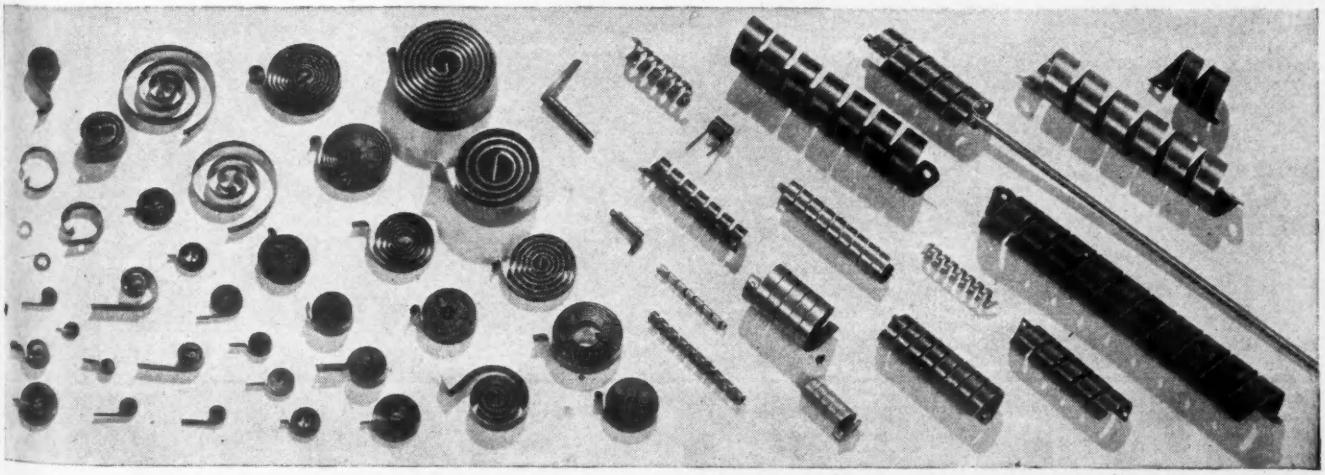
NI-SPAN C* New Constant Modulus Alloy

SPECIAL MATERIALS

*Reg. Trade Mark The International Nickel Co., Inc.

WILCO The H. A. Wilson Company

105 CHESTNUT ST. • NEWARK 5, NEW JERSEY • Branch Offices: Chicago, Detroit, Los Angeles, Providence



SPECIALISTS FOR 33 YEARS IN THE MANUFACTURE OF THERMOMETALS • ELECTRICAL CONTACTS • PRECIOUS METAL BIMETALLIC PRODUCTS

We like
UNITED STATES

customers

that are hard to please!

Why? **For the simple reason that they generally know exactly what they want—and appreciate it when they get it.**

IN this business of supplying alloy steel to industry, you have to take the bitter with the sweet. The "sweet" jobs—that go through the mill like duck soup, that any steel producer can handle with his hands tied—are nice to get, and we welcome them. But we don't side-step the other kind—the "bitter" jobs that really put a steelmaker on his mettle.

For when it comes to meeting out-of-the-ordinary alloy steel problems and requirements that demand special handling from A to Z—that require the utmost effort from both metallurgists and mill personnel—that just can't be done without exceptional knowledge and experience all along the line—we *know* we can please the customer.

We've done it in hundreds—yes, thousands — of cases, on jobs that other steelmakers were glad to pass up. And we've found out something that makes us particularly fond of "tough" customers. We discovered that the tougher the job put up to us, the better friends we made when we delivered the goods.

So, if you've got a "bitter" job that's been bothering you, bring it in. We'll try and sweeten it up for you.

CARNEGIE-ILLINOIS STEEL CORPORATION

Pittsburgh and Chicago

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
Tennessee Coal, Iron & Railroad Company, Birmingham, *Southern Distributors*
United States Steel Export Company, New York

7-980

Did you know?

. . . That no other single alloy steel producer can equal Carnegie-Illinois as regards versatility of equipment and facilities for production for all forms of alloy steels.

. . . That Carnegie-Illinois developed U·S·S Improved Heat Treating which provides greater uniformity in heat treatment and insures improved physical properties in the heat-treated condition.

. . . That Carnegie-Illinois is now producing new, improved carburizing steels for heavy-duty applications — U·S·S Super-Kore—which while costing less than higher alloyed carburizing steels show equal or greater hardenability and are easier to anneal, possess better machinability, and lower your manufacturing costs.

U·S·S Carilloy Steels

USS STEEL — UNITED STATES STEEL

ELECTRIC FURNACE OR OPEN HEARTH

COMPLETE PRODUCTION FACILITIES IN CHICAGO AND PITTSBURGH

S T E E L

PERSONALS

Recent Personnel Changes and Appointments at the Plants of Automotive and Aviation Manufacturers and Their Suppliers.

General Motors Corp., Chevrolet Motor Div.—**W. L. Tucker,** appointed Asst. Manager, Service and Mechanical Dept.

* * *

Twin Disc Clutch Co.—**Roger G. DeLong** has been made Manager and **W. B. Gibson** Sales Manager of the Hydraulic Div.

Ford Motor Co.—**Fred A. Thomson,** elected Secretary.

* * *

Borg-Warner Corp., Mechanics Universal Joint Div.—**C. E. Palmer,** named Vice-President in Charge of Manufacturing for both of the Division's plants, Rockford, Ill., and Memphis, Tenn. **Fred M. Potgieter,** elected Vice-President in charge of truck, agricultural implement, industrial and aviation sales. **G. C. Gridley** was re-elected President and General Manager and **R. R. Rolph,** re-elected Vice-President in Charge of Automotive Sales. **E. W. Deck** has been made consultant on manufacturing research.

Sheffield Corp.—**Richard Y. Moss,** Sales Manager of Machine Tool Div. and for the Measuray, or X-ray gage.

* * *

General Electric Co.—**Ray Stearns,** head of Marine and Aeronautics Engineering Div., retired and **H. C. Carroll** succeeds him in charge of the division.

* * *

Bendix Aviation Corp.—**Guy C. Fricke,** General Manager of the Bendix Zenith Carburetor Div., will assume additional duties of General Manager of Skinner Purifier Div., newly acquired by Bendix. **Ralph Skinner** will remain with the division in an advisory capacity.

* * *

The Timken Roller Bearing Co., Steel and Tube Div.—**Harry Y. McCool, Sr.,** Supt. of Maintenance, will retire. **Leland S. Steiner** has been named his successor.

* * *

General Motors Corp., Fisher Body Los Angeles Plant—**Charles E. Mudie** appointed Resident Comptroller.

* * *

American Brake Shoe Co., Kellogg Div.— **Selby F. Greer,** General Sales Manager.

* * *

McQuay-Norris Mfg. Co.—**Robert F. Jacobson** appointed Secretary and Treasurer. **Fred M. Stemmler,** Asst. Treasurer and **William J. Bolte,** Assistant Secretary.

* * *

Motor Wheel Corp.—**J. A. Watson,** in charge of automotive division manufacturing and **R. A. Cole,** in charge of Duo-Therm Division manufacturing.

* * *

Evans Products Co.—**Paul D. Davison,** Works Manager.

* * *

Pennsylvania Flexible Metallic Tubing Co.—**H. L. Boetsch,** appointed Vice-President in Charge of Sales.

* * *

Aluminum Industries, Inc.—**James J. Boyle,** Director of Sales and Marketing, **Walter E. Bennet,** Manager of the Service Division, Replacement Parts Div.

* * *

The Weatherhead Co.—**A. F. Spring** has been appointed to the newly-created position of Export Manager.

* * *

Douglas Aircraft Co., Inc.—**P. L. Porter** has resigned as Parts Sales Manager and is succeeded by **W. S. Fryer.**

* * *

Ryan Aeronautical Co., Metal Products Div.—**Richard H. Lillard** appointed Sales Engineer.

* * *

Metal & Thermit Corp.—**O. L. Howland,** Sales Manager of Welding Division.

* * *

Goodyear Tire & Rubber Co.—**Larry H. Coffin,** assistant to the vice-president and production manager.

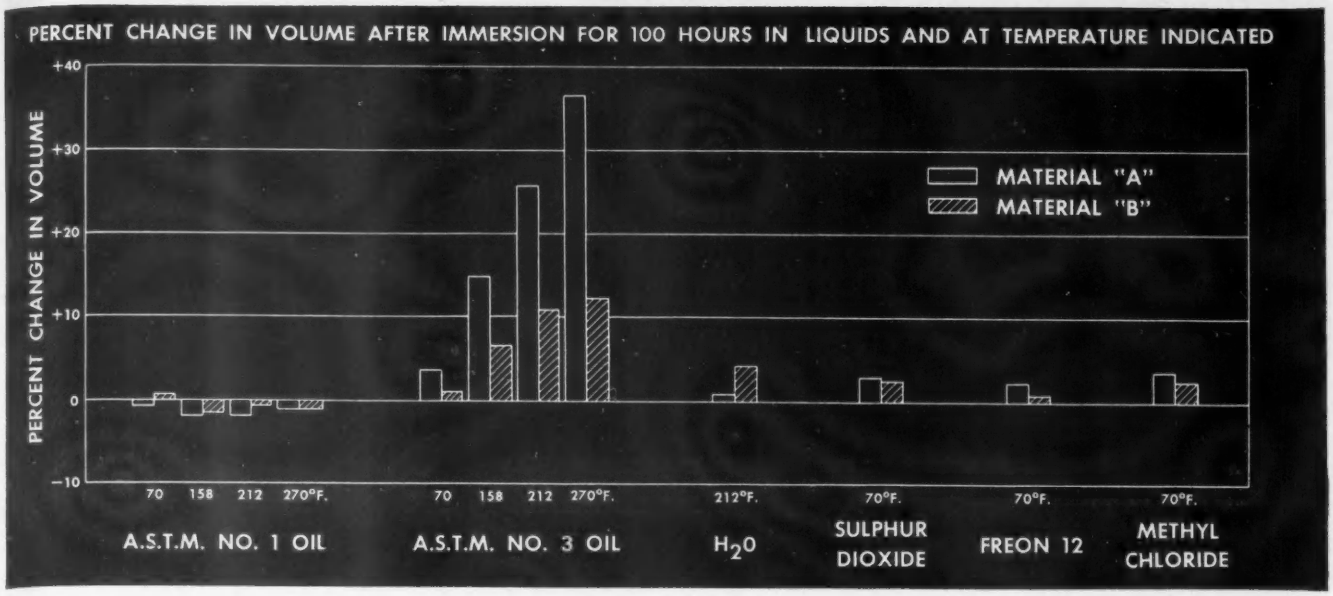
are produced by JOHNSON "Tappet Specialists" . . . men who have made the name JOHNSON a recognized leader in the tappet industry as a manufacturer of all types of precision tappets . . . Adjustable . . . Conventional . . . Hydraulic.

Through superior design and construction JOHNSON Tappets are able to meet the most exacting specifications for automotive, aircraft, marine and diesel engines.

Exhaustive testing has shown JOHNSON Tappets improve engine performance, give better service and last longer.

Write today for new, informative JOHNSON Tappet Bulletins . . . by the makers of tappets exclusively.

Johnson PRODUCTS INC.
MUSKEGON, MICHIGAN
"Tappets Are Our Business"



CHOOSING GASKETS FOR WIDE-RANGE USES

Careful balance of required properties needed for best performance

When a unit is designed to operate with one type of fluid at low pressure and at average room temperatures, gasket or seal specification is easy. But when the unit is to be used with several fluids at varying temperatures and pressures, the gasket chosen must offer the optimum balance of all needed properties.

The most obvious effect a fluid may have upon a gasket material is dimensional change. A fluid will shrink a gasket if it can dissolve part of the gasket's ingredients. The same fluid may swell another compound if that material tends to absorb part of the fluid. And certain combinations of materials and fluids can cause both phenomena to occur simultaneously. In the latter case, the gasket may remain stable in volume though it is changed chemically.

Fluids may also affect the durometer hardness and frictional properties of a seal. If the gasket is improperly selected, plastic flow, stickiness, or loss of tensile strenght may result. These effects can be aggravated by heat. Especially severe are conditions under which a gasket is alternately wet and dry. This may destroy the efficiency of the gasket by making it either porous or hard, depending on the particular fluids and materials involved.

Furthermore, if part of the gasket's ingredients are dissolved by the fluid, those ingredients may contaminate the fluid to such an extent as to make it unusable. Some fluids, when in contact with various compounds, also set up chemical reactions that tend to corrode certain metals.

Skillful compounding often can produce a material that performs well despite divergent operating conditions. For example, a manufacturer had been specifying a certain material for a shaft seal (Compound A, charted above). Though this material was considered satisfactory in view of the varied conditions under which it operated, Armstrong was assigned the task of finding something better. The Armstrong Research Laboratories then developed Compound B. As shown in the chart above, this new material offered greater over-all resistance to the fluids encountered. Consequently, it provided a higher safety factor and more satisfactory performance.

When selecting a gasket material for wide-range fluid resistance, we suggest you discuss your particular application with an Armstrong Representative. He will be glad to analyze the conditions it imposes and supply you with samples of the Armstrong materials proved to be most suitable.

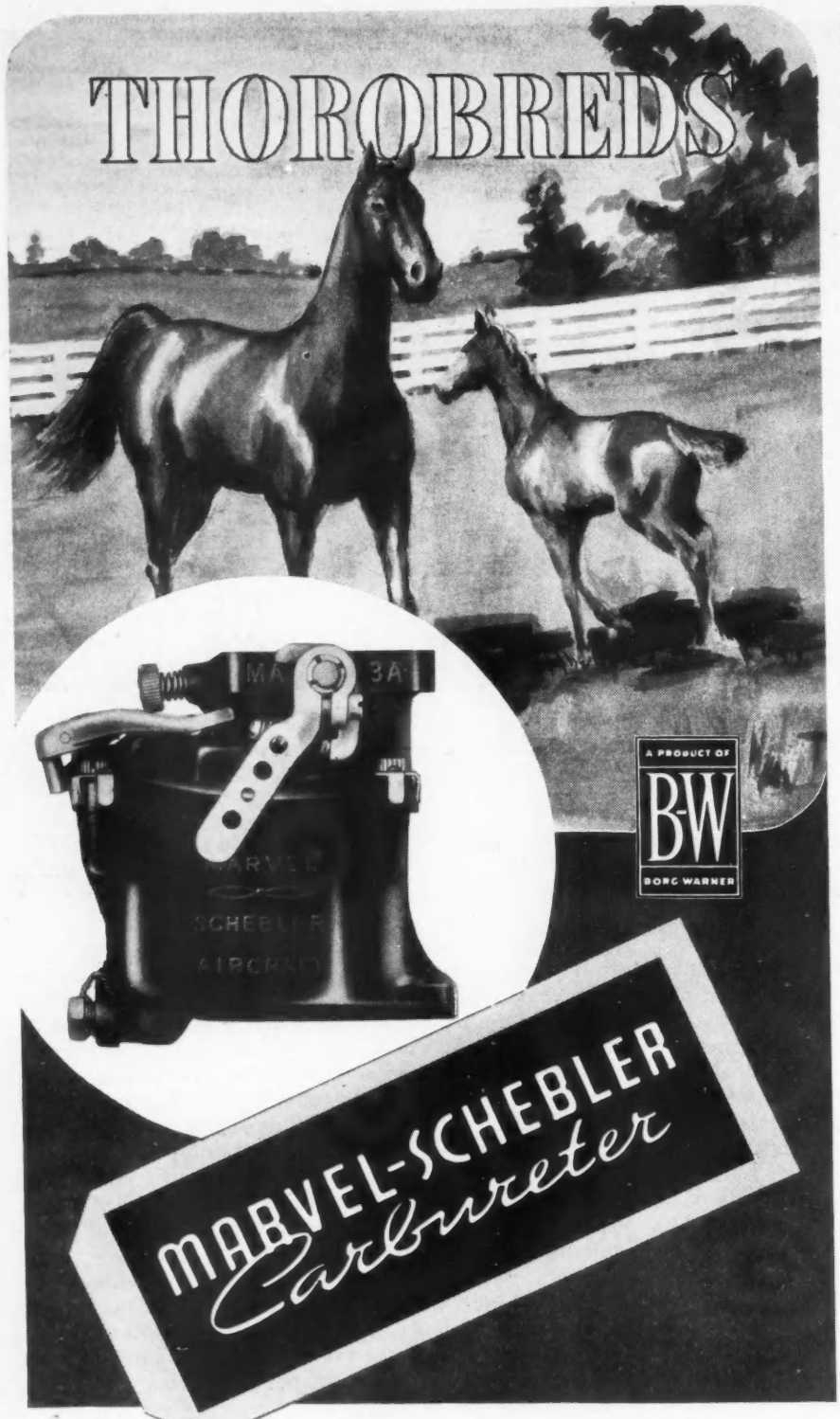
If you prefer, send drawings and details to us. You will find our recommendations keyed to good current gasketing practice.

SEND FOR FREE BOOKLET

Write for the new, 20-page 1947 edition of "Armstrong's Gasket and Sealing Materials." It includes specification data on more than 40 of Armstrong's resilient sealing materials and also helpful hints on their proper application. Write today to Armstrong Cork Company, Gaskets and Packings Department, 1509 Arch Street, Lancaster, Pa.

ARMSTRONG'S
GASKETS · SEALS · PACKINGS

Cork Compositions • Cork-and-Synthetic-Rubber Compositions
Synthetic Rubber Compounds • Cork-and-Rubber Compositions
Fiber Sheet Packings • Rag Felt Papers • Natural Cork



for **LIGHT AIRCRAFT**

for Car and Truck Replacement
for Agricultural Power Plants

MARVEL-SCHEBLER CARBURETER DIV.
BORG-WARNER ◆ ◆ FLINT 2 MICHIGAN

PUBLICATIONS

(*Continued from page* 60)

ciples of induction heating, advantages, sources of power, furnace controls and auxiliaries, types of induction heaters, typical coils and work stations. Many applications of the process are also illustrated.

D-72—Hydro-Power Boosters

Hydro-Power, Inc.—A new bulletin on the Hydro-Power hydraulic booster, pressure intensifier. The bulletin describes operation, lists sizes and dimensional information and considers booster applications, including schematic drawing of a typical hydraulic booster circuit.

D-73—Rototrol

Westinghouse Electric Corp.—What Rototrol is, what it does and how it works is outlined in a new 36-page booklet on automatic operation for electrical equipment. Seven pages of technical information are also included giving additional data on the theory, design and operating principles of standard Rototrols and several frequently-used modifications. The booklet is No. B-3649.

D-74—Automatic Lathes

Sundstrand Machine Tool Co.—The company's Model 4 Automatic Lathe is described and illustrated in an 8-page folder. In addition to the illustrations of the machine, information is given regarding spindle speeds, available cycles, special features, specifications, diagrammatic drawings, dimensions and shipping data.

D-75—Ni-Resist

The International Nickel Co., Inc.—A revised, 36-page booklet, Engineering Properties and Applications of Ni-Resist is available. The well-illustrated booklet gives detailed information on the physical and mechanical properties of Ni-Resist, a cast nickel alloy. Performance data under a wide variety of industrial conditions is described. Corrosion data for 400 corrosive media are presented in tabular form. The booklet is indexed.

D-76—Mounted Wheels and Other Abrasive Products

The Carborundum Co.—A new 32-page illustrated handbook, Mounted Wheels, discusses the wide range of wheel shapes and sizes, the variety of abrasives and coated abrasive discs, sleeves and cartridge rolls available for use on light-weight high-speed portable grinders. Photographs and diagrams are used to provide correct identification and selection and to illustrate careful handling and storing.

★ EXCELLENT ★

AGE RESISTANCE

RESILIENT parts made from HYCAR American rubber resist the aging effects of air, sunlight, ozone, heat, cold, and all other types of oxidation. That's why they *stay* resilient—and stay on the job for a long, long time.

Other important properties of HYCAR American rubber are shown in the box at the right. And it's important to know that these properties may be had in an almost limitless number of combinations—each compounded to meet a given set of service conditions.

We make no finished products of HYCAR. But we urge you to ask your supplier for parts made from this versatile material. You'll learn for yourself that it's wise to use HYCAR—in difficult or routine applications—for long-time, dependable performance. For more information, please write Dept. HD-9, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

CHECK THESE SUPERIOR FEATURES OF HYCAR

1. *EXTREME OIL RESISTANCE — insuring dimensional stability of parts.*
2. *HIGH TEMPERATURE RESISTANCE—up to 250° F. dry heat; up to 300° F. hot oil.*
3. *ABRASION RESISTANCE—50% greater than natural rubber.*
4. *MINIMUM COLD FLOW — even at elevated temperatures.*
5. *LOW TEMPERATURE FLEXIBILITY — down to —65° F.*
6. *LIGHT WEIGHT — 15% to 25% lighter than many other synthetic rubbers.*
7. *AGE RESISTANCE—exceptionally resistant to checking or cracking from oxidation.*
8. *HARDNESS RANGE—compounds can be varied from extremely soft to bone hard.*
9. *NON-ADHERENT TO METAL—compounds will not adhere to metals even after prolonged contact under pressure. (Metal adhesions can be readily obtained when desired.)*

Hycar
Reg. U. S. Pat. Off.
American Rubber

B. F. Goodrich Chemical Company
A DIVISION OF THE B. F. GOODRICH COMPANY

GEON polyvinyl materials • HYCAR American rubber • KRISTON thermosetting resins • GOOD-RITE chemicals

Air Race Classic

(*Continued from page* 44)

redesigned with smaller frontal area, and minor modifications to the vertical tail surfaces, justified in cases of wing clipping, were in evidence. Considerable cockpit equipment was removed, and numerous instrument panel holes were plugged, although it was difficult to tell in a hurried glance what was missing.

Painstaking care was taken with the finishing and polishing of the planes, and in the author's opinion some planes at the races were examples of the finest all-metal aircraft finishes ever produced. Lengthy descriptions of seemingly infinite alternate spray paint coats and sanding were obtained. In most cases wax polishing was used, and hours upon hours of such back-breaking polishing was put in overnight between races, frequently by the wives of pilots. The efficacy of wax coatings as drag reducers is no longer debatable, and it is now an important "must" for racing aircraft.

Equipment

In the high horsepower races, all pilots were required to wear safety belts, shoulder harnesses, crash helmets and anti-G suits, an innovation in commercial practice. This latter is a tight-fitting costume with an inner, sealed liner which is pumped up with air (or carbon dioxide) in such a manner as to exert a constant pressure over the torso, particularly from the waist down. This pressure resists the movement of the blood and vital organs down towards the lower body, created by high accelerations in vertical banks around the pylons. The magnitude of this force can be gaged by the fact that Lieut. Col. Benjamin S. Preston, Jr., pulled 14½ G's on a pylon turn during the running of the jet division of the Thompson Trophy Race. (The P-80A has a design load factor of 12, and considerable structural failure and permanent set could be seen in this particular plane after the race.) The reciprocating engine pilots frequently pulled 10 G's on their turns, and only the use of the anti-G suits prevented blacking out and probable internal injuries at this tremendous acceleration. No evidence of damage, other than considerable paint chipping, was found after the race on the reciprocating engine racers, however. All of the six P-80's displayed graphic evidence of the beating of their race with twisted wing tips, badly dented and wrinkled skin and air intakes, broken and missing canopies and extensive missing rivets.

New Design

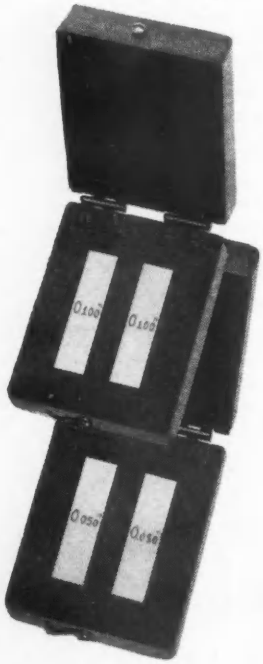
The Goodyear Trophy Race returned original design to the races and introduced two new elements: airplane airworthiness and pilot proficiency. The specifications for the event were prepared by the Professional Race Pilots Association, a group made up of the racing pilots themselves, to place safety foremost in the running of an air racing event. The airplanes were designed around engines with a displacement of 190 cu in. or less, which could not be altered in any way other than by the use of standard fuel-injection equipment furnished by the manufacturer from regular commercial stocks. No fuel requirements were established, however, other than that the airplane had to carry at least 15 gal.

Airplanes could not have a wing loading of more than 12 psf, thereby holding sinking speed and stalling speed within extremely safe limits. Flaps were prohibited. The planes could not weigh less than 500 lb, and several entries weighed astonishingly close to this figure. (Wittman's entry weighed 503 lb.) The landing gear

(*Turn to page* 80, *please*)

Now! Genuine Ford Johansson Sintered Tungsten Carbide GUARD BLOCKS

"A" Standard (±.000004")
"B" Standard (±.000008")



Protect your valuable Jo-Blocks with a pair or two of these new super-hard Johansson Guard Blocks! Simply wring them onto the ends of any Jo-Block combination and they'll fend off virtually all the impact and abrasion of any gaging job.

Practically Wear-Proof!

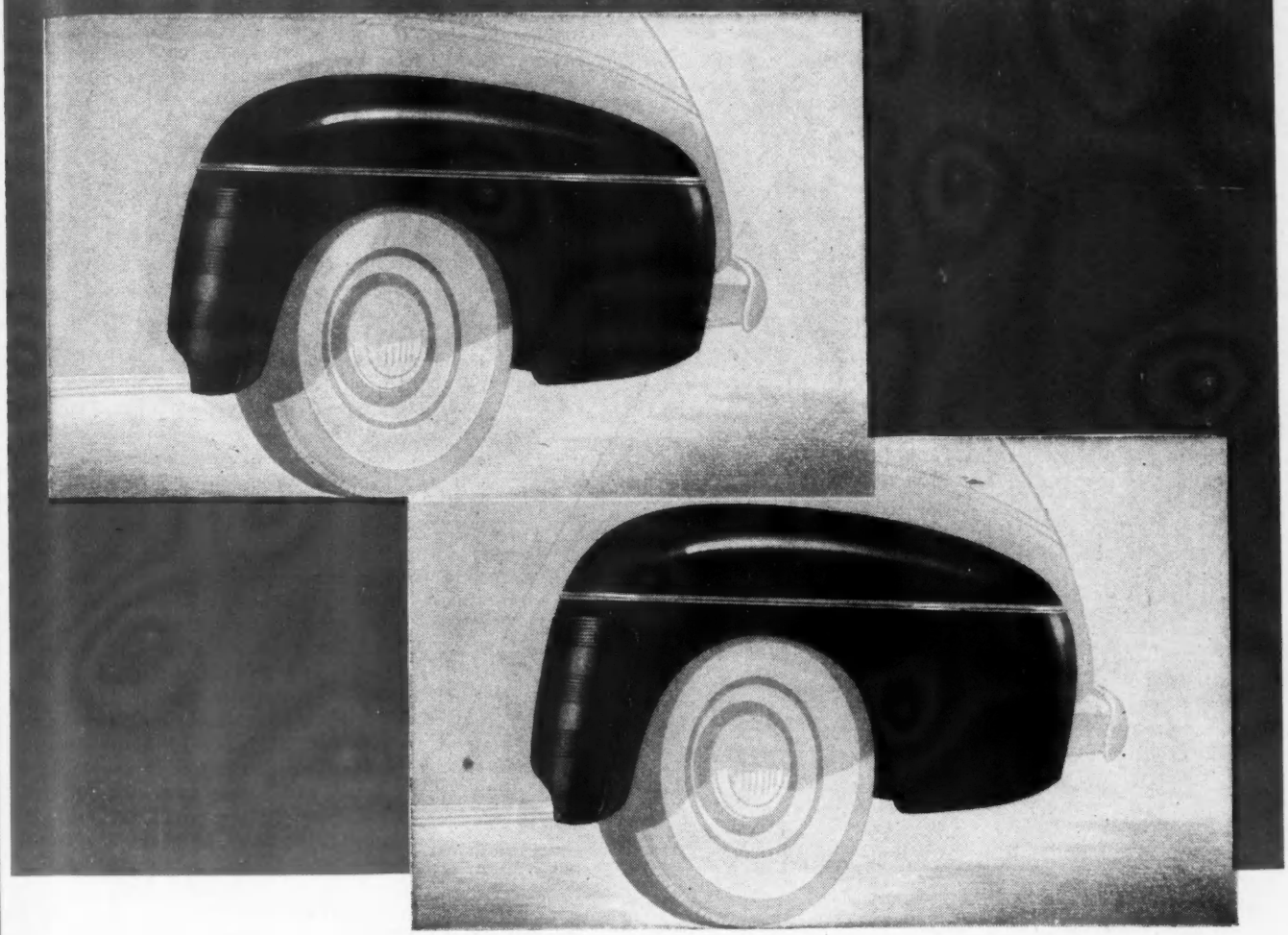
Made of finest Sintered Tungsten Carbide, finished to Jo-Block brilliance and accuracy. Available in "A" and "B" standards, and in thicknesses of 0.100" and 0.050", cased in pairs or complete sets of four blocks, at very moderate cost.

PATENTED AND WARRANTED BY FORD ● TO PROTECT AND ENORMOUSLY LENGTHEN THE SERVICE LIFE OF YOUR

Ford Johansson GAGE BLOCKS

FORD MOTOR COMPANY • JOHANSSON DIVISION
3602 Schaefer Road, Dearborn, Michigan

Sure, they LOOK ALIKE from where you sit



. . . but what a difference under the paint!

One of those gleaming new fenders is regular low-carbon steel; the other is N-A-X HIGH-TENSILE.

Because of the high yield strength of N-A-X HIGH-TENSILE, fenders and similar parts made of this steel will be considerably more resistant to denting. This characteristic, combined with other desirable properties of N-A-X HIGH-TENSILE, assures longer life with less maintenance cost.

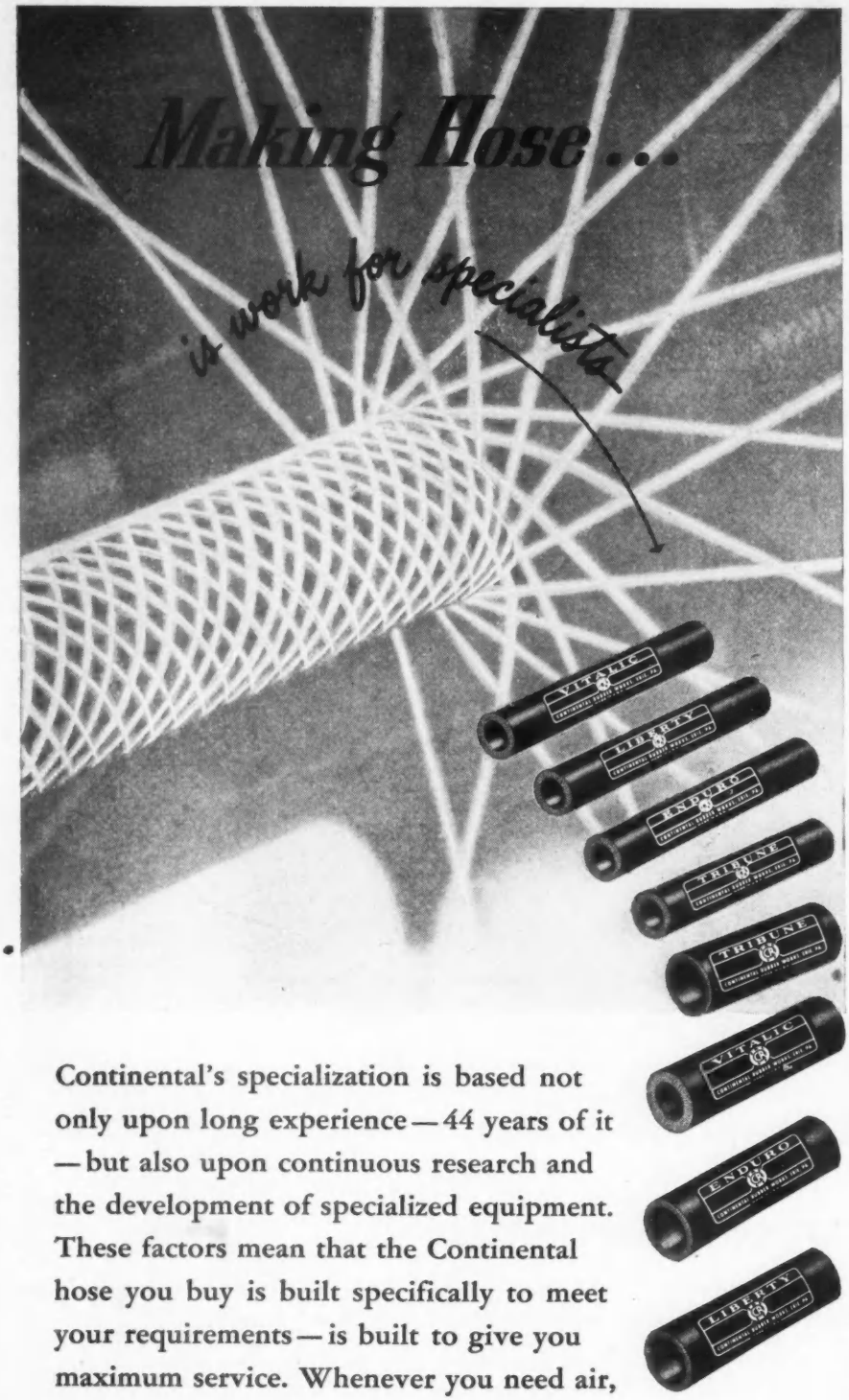
N-A-X HIGH-TENSILE's finer grain structure and higher hardness make possible a better finish without costly surface preparation.

N-A-X HIGH-TENSILE's higher corrosion (rust) resistance means that the fender will keep its new-car look and style much longer.

From any angle you look at it — manufacturer's, fabricator's, owner's—the N-A-X HIGH-TENSILE fender is far and away the better buy!

MAKE A TON OF SHEET STEEL GO FARTHER
Specify—
N·A·X
HIGH-TENSILE STEEL

GREAT LAKES STEEL CORPORATION
N-A-X ALLOY DIVISION • DETROIT 18, MICHIGAN
UNIT OF NATIONAL STEEL CORPORATION



Continental's specialization is based not only upon long experience—44 years of it—but also upon continuous research and the development of specialized equipment. These factors mean that the Continental hose you buy is built specifically to meet your requirements—is built to give you maximum service. Whenever you need air, welding, water, steam, or suction hose, why not consult Continental?

See Our Catalog in Sweet's

Rubber by CONTINENTAL

BRANCHES

Baltimore, Md.
Boston, Mass.
Buffalo, N. Y.
Chicago, Ill.
Cincinnati, Ohio
Cleveland, Ohio
Dallas, Texas
Dayton, Ohio
Detroit, Mich.
Greensboro, N. C.
Hartford, Conn.
Indianapolis, Ind.
Kansas City, Mo.
Los Angeles, Cal.
Lutz, Fla.
Memphis, Tenn.
Milwaukee, Wis.
New York, N. Y.
Philadelphia, Pa.
Pittsburgh, Pa.
Rochester, N. Y.
St. Louis, Mo.
San Francisco, Cal.
Syracuse, N. Y.

CONTINENTAL RUBBER WORKS • ERIE, PENNA., U.S.A.

Air Race Classic

(*Continued from page* 78)

could not be retractable, brakes were compulsory and wheels could not be smaller than 5.00 x 5 in.

Safety features required included: overturn structures capable of supporting the weight of the airplane and projecting higher than the pilot's head; vision 30 deg downward from the pilot's eyes to each wing tip, and 5 deg downward to the front in level flight; parachutes; safety belts; shoulders' straps; and crash helmets.

A demonstration of the airplane was required before representatives of the Technical Committee of the Association, including: full throttle takeoff without veering 30 ft to either side of a line on the runway, a six G pullup from level flight at 5000 ft, a dive at 1.3 times the maximum speed of the airplane, three tight turns of 120 deg without appreciable loss of altitude, and three laps over the course at full speed.

Pilot requirements included at least 500 solo hours or 10 hours in the racer for every 100 hours less than 500, two hours in the plane to be flown in the race during which time at least five takeoffs and five landings have been made, eight laps in racing fashion in the event pilot had not previously raced, and at least 10 hours in any airplane and two hours in the racer to be flown within the previous 90 days.

Goodyear Trophy Race winner was "Steve" Wittman's 10-year-old crimson racer which he had modified especially for the event. Wittman, who has participated in every National Air Races since the first one in 1928, used the fuselage and tail of his famed plane and redesigned only the power plant and wings. The main landing gear, also retained, is a full cantilever spring steel design he patented and sold to Cessna for their two-place commercial private plane. The Continental C-85, which was used exclusively in the race by all entrants, was enclosed in a hand-formed metal cowling which exited to the rear near the wing midpoint. The wings were of spruce spar and laminated wooden rib construction fabric covered. The fuselage was welded steel tubing structure fabric covered over tiny wooden fairing strips tied to the structure. The fabric was doped and painted, but not polished. Key to the success of the tiny craft appeared to be its light weight, which enabled the NACA 0009 symmetrical airfoil to fly at a low lift coefficient, thereby producing low drag.

Second place winner was the most impressive new design, not only in the races but in the country. Designed by Art Chester, long-time racing pilot, the

(*Turn to page* 82, *please*)

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*VAN DER HORST PROCESS

American Hammered Piston Rings

K KOPPERS

Air Race Classic

(*Continued from page* 80)

tiny ship featured a "butterfly" tail in which two surfaces, inclined upward at 38 deg provided both longitudinal and directional control, replacing the three surfaces of the conventional cruciform tail. Another innovation in this extremely impressive airplane was the use of fan-assisted cooling. Air is taken in through a hollow nose in the propeller spinner, and small fan blades within the spinner accelerate it rearward over the engine cylinders and out through combination cooling air and exhaust exits under each wing. Chester thereby obtained engine cooling through an inlet area far smaller than the others who relied on ram pressure alone for cooling. Not missing any possible advantages, Chester, who unconvincingly states he has retired from race flying, hired tiny Paul Penrose, 5 ft 90-lb Douglas DC-4 airline pilot, to fly his entry.

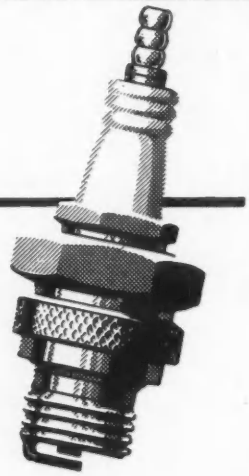
Most professional job was that done by Tony LeVier and Associates, a group of four backer-pilots, five engineers and 50 mechanics, who pooled their resources and spare time to design and build the new "Cosmic Wind" types. Engines and parts for five racers were completed, but only two were assembled and entered in the races. LeVier hopes to market the single-seat sportsters for about $5000. The craft is a low-wing monoplane designed and built in standard large all-metal aircraft practice. The spars are aluminum-alloy sheet riveted into a slim box with hand-flanged aluminum ribs riveted to the spar and flush riveted 24ST skin. Fuselage is hand-formed frames and extruded stiffener longerons with flush riveted skin. Ailerons, rudder and elevators are corrugated sheet. Landing gear is spring steel bolted to the main firewall frame.

The engine is enclosed in hand-formed streamlined fairings with small exits at the rear. About 10,000 man-hours went into the project with the design broken down into small assemblies to enable parts to be farmed out to the homes of the 50 mechanics. The two LeVier racers finished third and fourth, and throughout all the preliminary heats and the semi-finals flew not more than 50 ft apart.

The remainder of the 12 entries were less than half of the more than 30 backyard designers who had signified their intention to enter on the closing date. The others did not get their entries finished in time but all, and many others, have promised to be on hand with radical new craft for the 1948 races. The others were of a generally standard construction with wooden fuselage and wings fabric covered. Some had highly interesting detail design features, but as many had poorly designed parts, indicating the backyard nature of the event and the widespread appeal of the Goodyear event to pilots throughout the country. The tiny racers' wingspan averaged only 15-18 ft and length of 16-20 ft.

The Goodyear Trophy Race offers an opportunity for air racing to be safe, to be profitable and to encourage designers and pilots with only moderate means at their disposal. It assuredly should establish a pattern for additional events with similar rigid requirements and a democratic opportunity for sportster pilots. The domination of the past two National Air Races by surplus combat aircraft, which required several million dollars to develop and produce, affords little opportunity for the races to make the contribution to aeronautics it has so erroneously advertised. Rather was it blatantly obvious that science had contributed heavily to the National Air Races this year with laminar flow wings, water injection, high horsepower engines, high-strength structures and stable, controllable aircraft, all developed during the war.

6 out of 9*



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Windshield Washers

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Truck-Trailer Production Declines

Truck-trailer production continued its downward slide during April and May. Production has declined steadily since February of this year, and in April totaled 5277 units, a drop of 11 per cent from the 5942 units produced in March, according to th Census Bureau. May output dropped to 4646 units, the lowest monthly total since February 1946. Unless demand increases substantially or sales efforts are pushed it does not appear likely that the industry, with annual capacity in excess of 100,000 units, will be able to top their production record of 76,234 units turned out last year.

K-F Engine Div. On Three Shifts

Kaiser-Frazer Corp. has started three shift operations at the Detroit Engine Div., in order to boost production of engines to a goal of 50 per cent above the present output in the next 30 days. The Detroit plant has been supplying about 70 per cent of the engines required by K-F, with the balance obtained from Continental Motors.

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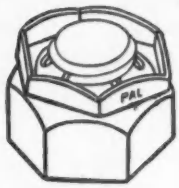
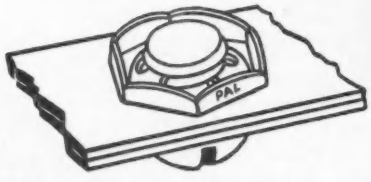


Used as locknut on heavier assemblies



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Business in Brief

Written by the Guaranty Trust Co., New York, Exclusively for AUTOMOTIVE INDUSTRIES

Narrow fluctuations in general business activity are indicated. The *New York Times* index for the week ended Aug. 23 stands at 144.3, as against 145.7 for the preceding week and 136.4 a year ago.

Sales of department stores during the week ended Aug. 23, as reported by the Federal Reserve Board, equaled 241 per cent of the 1935-39 average, as compared with 225 in the week before. Sales were 6 per cent below the corresponding distribution a year earlier, as against a preceding similar decrease of 6 per cent. The total in 1947 so far reported is 8 per cent greater than the comparable sum in 1946.

Electric power production increased slightly in the week ended Aug. 23. The output was 11.4 per cent above the corresponding amount in 1946, as compared with a like advance of 11.3 per cent shown for the preceding week.

Railway freight loadings during the same period totaled 900,895 cars, 0.6 per cent less than the figure for the week before but 1.8 per cent above the corresponding number recorded last year.

Crude oil production in the week ended Aug. 23 averaged 5,152,800 barrels daily, or 6350 barrels less than the preceding average but 316,650 barrels above the comparable output in 1946.

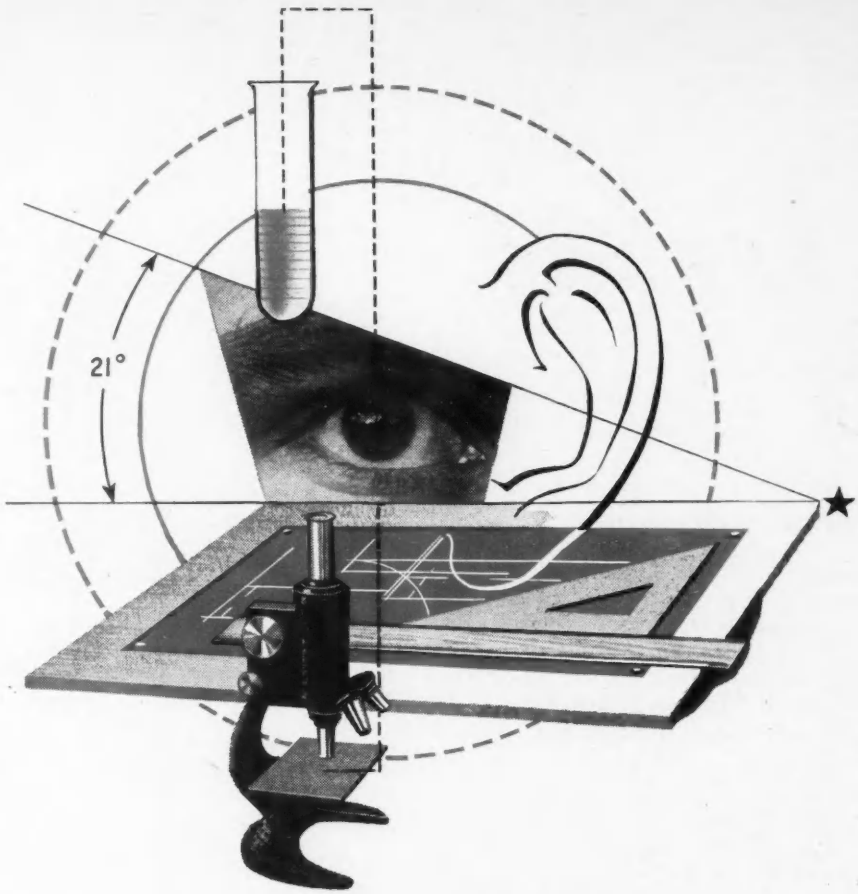
Production of bituminous coal and lignite during the week ended Aug. 23 is estimated at 11,950,000 net tons, 1.7 per cent more than the output in the week before. The total production in 1947 so far reported is 18.7 per cent above the corresponding quantity in 1946.

Civil engineering construction volume reported for the week ended Aug. 28, according to *Engineering News-Record*, is $136,943,000, or 25 per cent more than the preceding weekly figure and 71 per cent above the comparable sum in 1946. The total recorded for 35 weeks of this year is two per cent less than the corresponding amount in 1946. Private construction is 10 per cent below that a year ago, but public construction has increased by 11 per cent.

The wholesale price index of the Bureau of Labor Statistics for the week ended Aug. 23 is 153.5 per cent of the 1926 average, as compared with 152.7 for the preceding week and 128.4 a year ago.

Member bank reserve balances increased $86 million during the week ended Aug. 27. Underlying changes thus reflected include a decline of $158 million in Reserve bank credit and a decrease of $350 million in Treasury deposits with Federal Reserve banks, accompanied by an advance of $63 million in money in circulation.

Total loans and investments of reporting member banks increased $133 million during the week ended Aug. 20. An increase of $63 million in commercial, industrial and agricultural loans was recorded. The sum of these business loans, $12,301 million, shows a net increase of $2958 million in 12 months.



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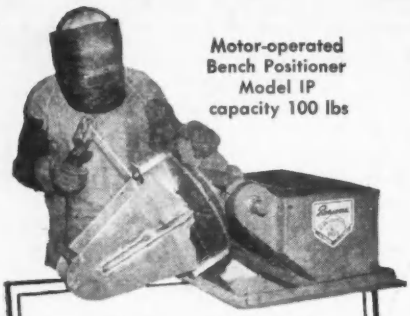

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General News

(*Continued from page* 47)

collection of such fees and administration of the law would be all out of proportion to the net revenue that might be collected. The American Automobile Association also is opposing the law on the ground that it would involve the establishment of a huge Federal bureaucracy; that it would add another tax burden to the already overburdened motorist; that it would duplicate state licensing authority; that it would enable the Federal government to deprive citizens of their right to drive and thereby earn their livelihood even in their own immediate neighborhood; and that it would inject confusion into the administration of driver licensing which has shown steady progress toward uniformity.

Parts and Accessory Makers Get Biggest Share of Steel

Steel Facts, published by The American Iron and Steel Institute, reports that parts, accessories, and automotive supply manufacturers received a larger percentage of sheet steel than did the automobile makers last year. The publication states that 1,914,694 tons, of the total of 3,935,111 tons of sheet and strip steel supplied the automotive industries in 1946, went to accessories and supply manufacturers. Automobile manufacturers got 1,697,273 tons, and truck builders obtained 323,144 tons. A considerable part of the tonnage received by parts and accessories manufacturers went into items that were later shipped to manufacturers for assembling into completed vehicles.

Obituary

Ettore Bugatti

Ettore Bugatti, 66, noted racing car manufacturer and automobile designer, died on August 21 in Paris, following a three-month illness.

Roy A. Chadwick

Roy A. Chadwick, 54, chief designer and director of A. V. Roe & Co., Manchester, England, and designer of the Lancaster bomber, died on August 23 in a test flight crash at Woodford, England.

Fred P. Underwood

Fred P. Underwood, 62, vice-president and secretary, Vanadium-Alloys Steel Co., Latrobe, Pa., died on Aug. 8 following an illness.

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